The Chemical Age

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

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The British Association

ON the whole it cannot be said that the meetings of the Chemical Section of the British Association, which ended on Friday, August 27, at Cardiff, reached the same high level of technical and general interest as those at the Bournemouth meeting last year. There is more than one reason for this. The British Association meeting of 1919 afforded the first opportunity of bringing to the notice of the public, both technical and lay, much important work of a chemical and technical character which had been done during the war, and had necessarily been kept secret up to that time. It is true that during the Spring of 1919 opportunity was found to present a number of papers dealing with war work to certain scientific and technical societies; but the field of war work was so vast that, taking the chemical side alone, there was a practically unlimited quantity of material to draw upon, and the British Association meetings of 1919, so far as the sectional work was concerned, were to a very considerable extent a record of war work of the most valuable character. This year no such circumstances existed to give a special interest to the meetings, and the Chemical Section was to some extent disappointing.

It is always difficult to appraise the value of papers read before the British Association in the normal conditions which, so far as the annual meetings of such a body are concerned, may now be said to exist. Much happens during the twelve months between the meetings, and it is seldom that new developments have not been presented to some scientific society or other during that period. Thus, by the time the British Association meets, many matters discussed are familiar enough to scientific and technical people, although they may not be, and indeed are not, so familiar to the general public. Even then, however, unless the subject is one which lends itself to a more or less sensational headline, the daily Press pays little attention to many of the more abstruse, though undoubtedly important, subjects discussed. It is from this point of view that the proceedings of the Chemical Section this year suffers by comparison with those of 1919.

A curious feature was that few of the faces familiar at the meetings, say, of the Society of Chemical Industry in London were seen at Cardiff, and although there was a crowded attendance on the occasion of the Presidential Address and the paper on industrial alcohol read on the same day, the attendance on the following days was small. Again, several of the papers were records of historical facts rather than evidence of new progress. For instance, the papers on tungsten explained a condition of things as it exists and is known—except, perhaps, to the general public, who would not remember it next week if they were told to-day—to all interested in the subject. The same remark applies to the paper on lubrication by Messrs. Wells and Southcombe, which had in substance already been communicated to at least two other scientific societies during the year, although perhaps in a different form. If the value of a paper is to be judged by the discussion, then the papers in the Chemical Section this year must be considered rather poor. In fairness, however, it must be said that discussion in the ordinary way is not an outstanding feature of the British Association sectional meetings. A number of papers are read, and the time available for discussion is usually almost negligible.

The most important subjects dealt with were the production of Industrial Alcohol, concerning which the Sectional Committee passed a resolution which was sent up to the Council of the Association, and Fuel Economy. In regard to the latter, it is strange that,

according to the evidence as it was placed before the Section, the Fuel Research Board should, so far, have ignored all attempts at co-operation by the British Association Fuel Economy Committee, remembering that the Fuel Research Board undoubtedly came into existence as the result of the vigorous campaign initiated in 1915 by Professor Bone and his colleagues when the Fuel Economy Committee was formed. Why Sir George Beilby, the Director of the Fuel Research Board, should have taken up this attitude it is difficult to understand. It can only be hoped that a more co-operative spirit will be cultivated in the near future, and the proferred co-operation of the Fuel Economy Committee with the Fuel Research Board accepted.

Chemical Manufacturing Costs

MR. J. W. GORDON, K.C., who served from 1915 to the end of the war as honorary chemical adviser to the Department of the Director General of Explosives Supply, makes a plea in the *Manchester Guardian Commercial* for closer co-operation between chemical manufacturers with a view to more economical production. In his official capacity Mr. Gordon had to keep an eye on the consumption of raw materials by the manufacturers of high explosives in order to promote economy in that direction, and it was found that the interchange of manufacturing experience led to the adoption of more profitable and economical methods of production. Valuable results of this experience in costing, &c., have already been made public, and, as we stated the other week, further volumes intended to give British manufacturers the benefit of the exceptional experience gained during the war may shortly be expected. These publications, however, do not affect the question which Mr. Gordon raises, which is—are there any difficulties in the way of securing in time of peace the co-operation among chemical manufacturers which produced such good results during the war?

Difficulties there are, of course, and Mr. Gordon admits they are formidable. The principal one is that under any such system of exchange as the Ministry of Munitions organised the more efficient manufacturer would be giving more value than he received, and making a present of his experience to the less efficient. This consideration is admittedly of consequence in relation to special manufactures where a limited market is supplied under highly competitive conditions. But these conditions, it is contended, do not apply to staple manufactures. As an example, Mr. Gordon takes the manufacture of sulphuric acid. "Here," he says, "there is a market price which is not affected by the economies secured by a particular manufacturer, and every manufacturer who can afford to manufacture at that price enters into the competition. Every such manufacturer competes in two ways. As a seller in the acid market he competes for orders, but as a buyer of sulphur or pyrites his competition tends to raise the price of the raw materials, and so to keep down the profits of his neighbouring manufacturers as well as his own. In such a case all the producers are interested in promoting the efficiency of the manufacture not in their own works only, but the efficiency of all the factories in which the manufacture is carried on."

The practical suggestion to which these considerations lead up is the appointment of a statistician, which might be confided to a department such as the Board of Trade or to a scientific body connected with the industry or to an *ad hoc* committee of the co-operating manufacturers. To bring the issue yet closer it seems to us a matter for the Association of British Chemical Manufacturers, the body which specially represents the manufacturing interest. Many such organisations have already effectively dealt with such questions as costing, and though this is not precisely the same it is very similar in its fundamental principle, which is that of co-operative and co-ordinated action in the interests of all without any undue entrenchment on the privacy of each. It is generally agreed that the individualist attitude in this country has been overdone. An old and deeply rooted habit of commercial secrecy and exclusiveness is not easily overcome, nor, indeed, can it ever be dropped completely. But concerns which have hitherto regarded themselves as mutually competitive are finding that they have many common interests, and collective action up to the full measure of such common interests can do nothing but good to British industry.

Germany's Latest Discovery

A REVIEW by Mr. Holman A. Holz, of Berlin, of the developments in chemical and metallurgical engineering in Germany during the past six years discloses only one new point of any real interest, and that at present is wrapped in mystery—namely, a scientific apparatus for locating deposits of minerals after the traditional fashion of the water-diviner. The large manufacturing plants and research laboratories of Germany were largely engaged throughout the war in the production of substitutes for materials not obtainable on account of the Allies' blockade. Nearly all these substitutes, developed mostly by the chemical industry, have since ceased to possess any commercial value. The only one which has a chance to live is the paper textile industry, and the future of even that is extremely doubtful. The synthetic ammonia industry will, of course, remain, and the large German aniline concerns are reported to be increasing the capacity of their ammonia plants, in order not only to make Germany independent of foreign sources but especially to export the surplus output, and so to pay the war bill.

The really new development, however, is the process already referred to for definitely locating mineral and non-mineral deposits (ores, coal, salts, oil, gases, water, &c.) in the earth from above ground, for accurately determining the position, depth, width and thickness of each deposit, and for differentiating between the various materials forming the deposit. Thus if the apparatus is adjusted for lead it is acted upon only by lead and by nothing else, and the number of materials it can be adjusted for amounts, it is stated, to over 100, and is constantly being increased. Thoroughly practical and reliable apparatus, we are assured, has been developed for this purpose, and is already being used with wonderful success in central Europe. The apparatus is described as offering unlimited possibilities

for locating new fields of mineral deposits, and it shifts the responsibility on to the labourer to get the minerals out of the German ground, which possesses very large deposits of oil, potash, coal, asbestos, &c.

Mr. Holz claims to have personally investigated this process most thoroughly for several weeks, and to have checked the results indicated by the apparatus by borings, and apparently he is entirely convinced of its scientific soundness and greatly impressed by its commercial possibilities. The only disappointment in his account of the discovery is that no hint is given of the character of the apparatus, nor any facts or figures as to the experimental results obtained. This, of course, was to be expected, for the discoverer of such a process would naturally not make any premature disclosure of his secret, and would not be indifferent to securing an adequate financial return. For the moment, therefore, it is impossible to offer any opinion on Mr. Holz's announcement except to say that it seems quite a scientific possibility, and that, if half that is claimed for it be well founded, it should prove of great value in unearthing the hitherto untapped souces of metallurgical wealth.

Chemical Industries in Egypt

In the review, published in this number, of the work of the Egyptian Government Analytical Laboratory and Assay Office for the years 1913-1919, reference is made to promising developments of chemical industry in Egypt. In the case of sulphuric acid, it was concluded that, although the principal raw materials would have to be imported, a factory could scarcely fail to be a source of profit and of great advantage to the country. As the results of inquiry into the possibilities of cement manufacture a cement factory is now being constructed at Makwar in the Sudan, where 50,000 tons of cement per annum will be made, the fuel difficulty having been overcome by the use of a mixture of locally-made charcoal and imported coke. Altogether the Government authorities appear to be quite alive to the importance of encouraging as far as possible the application of chemical science to arts and manufactures.

Probably the most important branch of chemical research to the future of Egypt is that relating to Egyptian crude petroleum, with the idea of determining the best methods of obtaining products which can be manufactured on an increasing scale in the Government refinery to be erected at Suez. The results so far obtained show that it is commercially possible to obtain large yields of an excellent Diesel fuel oil, besides petroleum spirit and kerosene, and also a pitch that should be valuable for road making or a good still coke for foundry purposes. The troubles in distillations arising from the presence of salt water and the refractory emulsions in some of the local oils are also being investigated. Electrical separation of these emulsions under high voltage currents is said to have given promising results, but the investigation is still far from complete. The account of the operations of the Analytical Laboratory and Assay Office gives the general impression that some very useful work, having a close relation to the development of Egyptian industries, is being carried on.

Value of the Trade Press

Sir John Benn, in addressing the annual meeting of the shareholders of Benn Brothers, Ltd., did not exaggerate the importance of the part the trade and technical Press of this country plays in the maintenance and development of British trade. When the war broke out, it incidentally divided business men into two classes. On the one hand there were those who had scarcely any business at all left, or who had more than they could cope with. For entirely opposite reasons they decided to curtail or to stop altogether their expenditure on advertising. Their immediate needs being met, they assumed they could afford to let the future look after itself. On the other hand there were those who, as Sir John Benn picturesquely put it, kept their flags flying or their signboards swinging. They realised that, even though normal business were suspended, its resumption after the war would depend on whether their commercial machinery and connections had been maintained in an efficient state. It is safe to say to-day that those who thus looked ahead have had no reason to regret their policy. The firms that are recovering most quickly from the effects of the war are those which cultivated a spirit of optimism and prepared themselves for a quick restart. By a far-sighted policy of maintaining their publicity arrangements they kept their names steadily before the trade, and were thus able to resume without delay the old trade connections. Those who followed the opposite policy have probably since found that they have lost a valuable start through misconceived economy. The trade and technical Press may claim a large share in helping to keep British trade going so well during the war, and its value is certainly not less in peace conditions. An examination of trade statistics would assuredly show that the expanding firms are those which treat systematic and continuous publicity as an essential part of the machinery of business.

The Calendar

Sept. 8	Institution of Petroleum Technologists: "Petroleum Refining," by A. E. Dunstan. 6 p.m.	Canada Building, Crystal Palace. London.
15	Institution of Mining Engineers: Annual General Meeting.	Manchester.
15–16	The Institute of Metals: Autumn Meeting.	Barrow-in-Furness.
21–24	Iron and Steel Institute: General Meeting.	Cardiff.
Oct. 1	Society of Chemical Industry (Manchester Section): "The Structure of the Molecule in Crystalline Solids," by Professor W. L. Bragg. 7 p.m.	Grand Hotel, Manchester.
9	Mining Institute of Scotland: General Meeting.	Edinburgh.
18	Physical Society of London and Faraday Society (Joint Meeting): "The Physics and Chemistry of Colloids."	London.
18	Royal Automobile Club: "Alcohol Motor Fuel," by Professor H. B. Dixon. 9 p.m.	Great Gallery Royal Automobile Club, Pall Mall, London.

Possible Sources of Home-Produced Motor Spirit

By E. de Barry Barnett, B.Sc., F.I.C.

The author deals in a comprehensive manner with a much-discussed subject. Particular interest, perhaps, will be found in his suggestions for the hydrogenation of aromatic bodies so as to yield hydroaromatic fuels of low denisty.

THE rapid increase in motor transport, coupled with unmistakable signs of the exhaustion of the world's petroleum reserves, has rendered it necessary to explore every possible source of motor spirit. So far no very striking success has been achieved, but there are still several possible sources of suitable spirit which have not yet been examined.

In Great Britain the motor spirit problem is particularly acute, as almost the only supplies available have been obtained from overseas, a state of affairs which at present is most undesirable, as the import of large quantities of petrol tends to maintain an adverse trade balance. The danger of being almost completely dependent on overseas supplies of what must be regarded as an essential munition of war needs no emphasis. It is improbable that this country will ever become self-supporting with regard to motor spirit, but there seems no reason why very considerable amounts should not be made available, which, if not sufficient for all purposes, would at all events be available for military use in case of war. The home production of any considerable amount of spirit would also have the very desirable effect of checking the upward tendency in the price of the imported article.

The possible sources of home produced spirit can be classified under seven heads, namely, natural oil, shale, lignite, coal, alcohol, and acetone. Natural oil can probably be neglected as the results obtained by the trial bore holes have been very disappointing. It is true that oil has been "struck," but the yields from the wells have been extremely small and not such as would encourage drilling on an extensive scale.

The Scottish shale deposits seem to be nearing exhaustion and the mineral now obtained is very poor, the total yield of oil being only about 15 gallons per ton. In any case, the distillation of shale can only be carried out on a remunerative basis by utilising the by-products, more especially the ammonia, and it is probable that distillation ammonia will be hard hit by the synthetic article. It is true that vast deposits of rich shale are said to exist in the eastern counties and that a company has been formed to work them; but so far the proposition can hardly be said to be a proved commercial success. It is quite likely, however, that a welcome addition to our motor fuel supplies may be obtained from this source. The oils are very rich in sulphur and this sulphur is in a form which is difficult to remove, so that a considerable amount of research may be necessary before a really suitable spirit can be placed on the market. The same difficulty, *i.e.*, excessive amounts of sulphur compounds in a form difficult to remove, is met with in the oil which can be obtained from the so-called "Kim Coal" found near Wareham in Dorset.

Prospects in Devonshire

Considerable deposits of lignite are known to exist in the Bovey Tracey district of Devonshire, and so far no attempt at all seems to have been made to work them. It is very probable, however, that this will be done in the near future, as the company which intended erecting hydroelectric stations on Dartmoor is now turning its attention to these deposits. If the lignite is gasified in producers, so as to obtain power gas, no petrol, of course, will be available. The working of the deposits, however, will probably lead to systematic distillation experiments, and if the yield of motor spirit is satisfactory there seems no reason why considerable amounts should not be obtained.

The distillation of coal, both in gas works and in by-product coke ovens, gives rise to large quantities of aromatic hydrocarbons, although at present only a small proportion, about 20,000,000 gallons a year, is recovered. If "stripping" was carried out at all coal carbonising plants probably some hundred million gallons of benzol would become available. The benzol used as a motor spirit consists chiefly of benzene and toluene with a comparatively small quantity of xylene, the boiling-point of this last being too high for use except as as an admixture. The spirit can be used in the ordinary carburetter without special adjustment, but to obtain the best results special tuning up is necessary as the density of benzole is considerably greater than that of ordinary petrol, and, in addition, it requires considerably more air for its combustion. Now it is well known that aromatic hydrocarbons can be reduced to hydroaromatic compounds by passing their vapours mixed with hydrogen over a suitable catalyst, such as finely divided nickel. These hydroaromatic hydrocarbons closely resemble the paraffins in their chemical properties, and their densities and boiling points are considerably lower than those of the aromatic hydrocarbons from which they are derived. This will be clearly seen from the following table:—

	Boiling-point °	Sp. gr.
Benzene	80·4	0·879
Hexahydrobenzene	80·7	0·729
Toluene	110·7	0·871
Hexahydrotoluene	101·0	0·772
m-Xylene	139·0	0·864
Hexahydro-*m*-xylene	120·0	0·772
Naphthalene	218·0	0·801
Hexahydronaphthalene	200·0	0·934
Octohydronaphthalene	185–190	0·892
Decahydronaphthalene	173–180	0·837
Dodecahydronaphthalene	153–158	—

The hydroaromatic hydrocarbons have the further advantage as motor fuels that they have extremely pleasant flowery smells, and in all probability would not damage paint work to the extent that benzol does. The trouble, however, is that before an aromatic hydrocarbon can be hydrogenated it is absolutely necessary to remove every trace of sulphur containing compounds, including thiophene. At present this is a somewhat expensive operation, as washing benzol with considerable quantities of highly concentrated sulphuric acid leads to loss by sulphonation. There would seem to be no reason, however, why a cheaper and more effective process should not be devised. When speaking of sulphur in motor benzol it is worth remarking that the specification for motor benzol adopted by the National Benzol Association fixes the limit as high as 0·5 per cent. This figure is equivalent to nearly 2½ oz. of sulphuric acid to the gallon, and although the amount of sulphur actually found in motor benzol is far below the limit of the specification, it is not surprising that the economical motorist refuses to risk turning his engine into a miniature chamber plant. Why the sulphur content should have been fixed so high is not clear, unless some of the associated firms were producing a spirit with a sulphur content of approximately this magnitude.

Hydroaromatic Bodies

Returning to the production of hydroaromatic hydrocarbons it is clear that if this could be effected on a technical scale an increased supply of an improved spirit would be available, and the undertaking should be an alluring one from a financial standpoint, as spirit is always sold by volume, and decrease in specific gravity naturally means increase in volume, 1 gallon of benzene giving 1⅓ gallons of hexahydrobenzene. Where gas works are concerned stripping the gas leads to two troubles, viz., the calorific value and illuminating power are decreased so that it becomes necessary to enrich the gas with oil, and the absence of benzene causes a gradual deposition of naphthalene with consequent stopping up of pipes. At present, owing to the high price of oil for carburetting, it does not pay gas works to strip their gas, but quite possibly some of the hydroaromatic hydrocarbons might prove well adapted for enriching purposes, although boiling at too high a temperature for use as motor spirit. Alternately these higher hydrocarbons would probably "crack" fairly easily and be thus broken down to open chain hydrocarbons closely resembling petrol.

A further source of spirit obtainable from coal lies in the alcohol which can be obtained from the ethylene in the per-

manent gas by treatment with sulphuric acid under suitable conditions. Early in the present year very optimistic reports were published of experiments which had been made in this direction, but from the information available it scarcely seems that the process is yet a practicable one, and, indeed, in the writer's opinion, it is very doubtful if sulphuric acid is the right reagent to use for effecting the addition of water. It has been calculated, however, that if the whole of the ethylene at present produced by the carbonization of coal were converted into alcohol an additional 50,000,000 gallons of liquid fuel would be made available. The problem is, therefore, one which is well worth further research.

The production of fuel alcohol by the fermentation of starch or sugar is a proposition which has been much talked about of late. It is doubtful however, if starchy or saccharinic plants could be grown in this country in sufficient quantity, and at a sufficiently low price, to render the production of fuel alcohol a paying proposition. In this connection the great effort that was required during the war to produce sufficient home-grown food should be borne in mind. The production of alcohol by the hydrolysis and subsequent fermentation of sawdust and other cellulosic substances presents many technical difficulties, although these are gradually being overcome. In this country, however, it is improbable that the process will ever become of any practical importance, as for success the process must be worked in conjunction with large saw mills. Such mills do not exist in this country, and the cost of transporting sawdust from the smaller mills to a central by-products establishment would be prohibitive.

Fermentation Processes

The direct fermentation of cellulosic substances without previous fermentation has long been known, although never apparently studied in any great detail. Among the products of direct fermentation acetic acid figures largely and it has been claimed that under suitable conditions about half the weight of the cellulose appears in this form, the other 50 per cent. being converted into a combustible gas containing considerable quantities of methane. This fermentation is brought about by a thermophil organism which grows best at a temperature of 60°C., so that from a technical point of view the process has the great advantage of rendering sterilisation unnecessary as it is improbable that any deleterious organism would be capable of growing at this temperature. From acetic acid the production of acetone is a fairly simple operation, and acetone should be quite suitable as a fuel for internal combustion engines, either alone or as a dilutant. Its boiling point is 56°C., and its density is 0·797, so that its use does not involve any readjustment of a carburetter tuned up for petrol, provided the air supply is under control. Its heat of combustion is somewhat low, but this is more than compensated for by the fact that much less air is required for its combustion. In this connection it is interesting to compare the heats of combustion of various fuels. The mileage, *i.e.*, ton-miles per gallon, obtained depends on the number of calories liberated by the combustion of one *cubic centimetre* of the fuel. The power developed, on the other hand, depends not only on the heat liberated by the combustion of *one gram* of the fuel, but also on the number of grams which can be burnt in the cylinder at each stroke. In the following table "mileage ratio" is expressed as the heat of combustion of 1 cc. of the fuel, "combustion ratio" as the number of *grams* of fuel which can be completely burnt by 1,000 cc. of air, and "power ratio" as the product of the "combustion ratio" and the heat of combustion of *one gram* of the fuel. The figures given are only approximate :—

	"Mileage Ratio."	"Combustion Ratio."	"Power Ratio."
Petrol (Heptane)	7·94	2·02	2·32
Benzene	8·8	2·24	2·24
Hexahydrobenzene	6·8	2·08	2·31
Alcohol	5·6	3·36	2·37
Acetone	4·13	3·25	2·44

It will be seen that the mileage obtainable from acetone would be very poor, less than half that obtainable from benzene, but that there would be no lack of power. Hence it would mean that in order to compete with petrol it would be necessary to sell acetone at half the price. Whether acetone could be produced at a sufficiently low price by a fermentation process is very doubtful, but it is worth noting that a circular letter was issued last May by the Power Gas Corporation, Ltd., in which they invited their shareholders to subscribe to a new company, to be called Power Spirits, Ltd., which was to have a nominal capital of £30,000, the new company being floated in order to develop Langwell's patents for the production of acetic acid and acetone by fermenting waste straws. Should the process prove successful it is quite likely that the fermentation of substances such as heather or bracken would be possible, thus enabling power spirit to be produced from raw material grown on land otherwise quite unsuited for cultivation. The production of acetic acid, and from it acetone, is also possible from acetylene, but it is exceedingly improbable that the acetone could be produced in this country at a price that would render its use as a fuel feasible.

Both alcohol and acetone are miscible with water, so that adulteration is a simple matter, but there should be but little difficulty in guarding against this by selling in sealed tins. On the other hand, with a suitably designed engine the addition of a certain amount of water might be of considerable advantage, as it would tend to convert an explosion engine into an expansion engine.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

Locality of Firm or Agent.	Materials.	Ref. No.
Melbourne ...	Glassware	412/20 7/159
Amritsar ...	Glass	257
Montreal ...	Druggists' sundries	263
,, ...	Gelatines; colours	265
,, ...	Glue...	268
,, ...	Druggists' supplies ...	271
Oporto ...	Paints; varnishes...	288
Buenos Aires	Low phosphorus; hermatite. ... Replies to Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1.	—
Paris	Chemical products...	—
Australia (Sydney)	Photographic supplies	—
San Francisco.	Chemicals; varnish	—
Canada ...	Copper sulphates; arsenic acid ... Replies to Canadian Government Commissioner's Office, Portland House, 73, Basinghall Street, London, E.C.2.	—
	Industrial chemicals	—
	Paints; oil; varnishes	—
Brussels ...	Industrial chemical products; formol; acids; seed oils.	—

Production of Photographic Chemicals

The difficulties in the way of the production in this country of a number of PHOTOGRAPHIC CHEMICALS on a commercial basis have been overcome, and, it is stated, sufficient manufacturing plant now exists in England to secure an output adequate to the world's demand. German producers are seeking to re-establish their connections with the trade here and in foreign countries, and by under-cutting of prices to re-establish their former monopoly. The low exchange value of the German mark gives them a great advantage in the competition with British manufacturers; but the latter are resolved not to be outdone, and are instructing their agents to meet the attempt to under-sell them.

Egyptian Analytical Laboratory and Assay Office

Review of Six Years of War Work

We give below a review of the Report on the work of the Government Analytical Laboratory and Assay Office during the period 1913-1919, *by A. Lucas, F.I.C., Director, just issued by the Ministry of Finance, Egypt.* (*Government Press, Cairo, pp.* 55, *price* P.T. 10.)

THIS volume covers the period of the war and armistice, and certain of its features are intimately concerned with the political situation of Egypt. Moreover, it is the first published report dealing with the results of the reorganised Assay Office and the value of the Assay Law of 1916, whereby the hall marking of gold and silver was made compulsory.

Government Analytical Laboratory

The work may be divided into three sections: (1) The examination of materials. (2) Advisory work. (3) Special research work.

Examination of Materials

This comprises chiefly the examination of materials of all kinds for almost every Government department, special war work for the British Army, and important and interesting work for the police and the Ministry of Justice. Such examination of all samples for contracts effects a great saving of public money, inasmuch as it ensures the best articles available being obtained, besides being a check on fraud. The director, Mr. Lucas, has some interesting remarks to make on the unbusinesslike way in which many contractors still continue to submit samples. Some are too small for examination, some badly packed or inadequately marked, and some totally unlike the material specified; whilst others send no sample, merely stating that they were the previous suppliers and consider this sufficient. Contractors even assume that their material satisfies the specification because they write and say it does, or they purchase a specimen of the material required from the department calling for tenders, send it for inspection as their own sample, and afterwards substitute their own manufactured articles, usually of inferior quality.

The presence of the armies in Egypt drew attention to the whole liquor trade of Egypt, and very beneficial results were obtained from the inquiry. Incidentally, the work done has exploded the popular belief that drinks for soldiers were deliberately drugged on a large scale. It was found that, although the drink trade was in a very bad state, the "drugging" was merely the effect of over-drinking liquors, largely made from artificial essences and "plain" spirit, whose strong powers were not realised, and to which troops were not accustomed. Legislation was passed prohibiting the importation of all artificial essences and extracts of chemical origin whose addition to "plain" spirits, aided by cleverly imitated labels, gave very dangerous products. In the year following the first proclamation regarding these liquors 1,447 samples were analysed, of which 31 per cent. were found adulterated or wrongly described. As a result, fines amounting to over £2,000 were imposed, imprisonment given in some cases, bars and distilleries were closed, liquors destroyed, and many bars put "out of bounds" to soldiers.

Inspection of the alcohol sold by street vendors for burning purposes has proved the necessity for continual and more complete inspection, for dilution of the alcohol is indulged in to a large extent. In fact, the whole question of the sale of alcohol needs revision.

Tobacco and cigarettes from local vendors were in some cases found largely adulterated with foreign leaves, especially banana leaf, and occasionally contained no tobacco at all.

The recent publication of Mr. Lucas's "Legal Chemistry and Scientific Criminal Investigation" has shown the extent to which he has personally specialised in chemical work of this kind. In his Departmental Report he instances some of the more important cases which have been brought before him. One of these consisted in a claim against the Government for land valued at about £16,000,000; but, unfortunately for the claimant, it was found that out of 168 documents on which he placed reliance no fewer than 163 were forged! Another is that of a counterfeit coining case, where 37 convictions were obtained; whilst the work in connection with the various bomb outrages was of extreme importance. It must represent a great saving to the Government to be able to get their chemico-legal work done without calling in outside experts, whose services would have to be paid for at a high rate.

It was found that the stamp used on meat at the Government slaughter houses was being counterfeited, and means were devised for the ready detection of any future counterfeited branding. Similar work was done for the Cairo City Police for the stamping of certificates issued by them.

The examination of kerosene sold in Egypt from 1913–1919 has shown the satisfactory point that it is getting safer for general use, in as much as it is now manufactured in such a way that it will not give off inflammable vapours at as low a temperature as formerly. Whereas in 1913 only 2·1 per cent. of samples flashed at 100°F. or above, in 1919 65·2 per cent. had this flash point. A large amount of confidential work for the Intelligence Department of the Army was done during the war, but only a few details of it are given. A thousand chemical lighters for flares and 100 small incendiary bombs for a special purpose were made, whilst instruction was given in examining anti-gas masks, and such questions as the destruction of telegraph poles and iron girders in enemy countries.

Advisory Work

Prominent among the questions raised for advice and guidance have been those relating to the storage and handling of goods of inflammable nature, and in view of the fact that in the near future Egypt will be a very important storage ground for petroleum products, and that aviation and motor transport will be greatly increased, the importance of these questions cannot be over-estimated. Special attention has been given to fire risks at Suez Basin, Port Said, and a proposed petroleum spirit store near Cairo.

A very thorough investigation was made by the director on the origin of cotton fires. This involved a large amount of research work, and, in view of the importance of cotton in Egypt, the report issued on the subject deserves to be more widely known. One interesting conclusion was that, of the large number of fires investigated, none was due to wilful incendiarism or to spontaneous combustion. The denaturing of alcohol and the large use of arsenic in Egypt were also the subject of inquiry.

Chemical Industries in Egypt

A report has been prepared on the advisability of establishing chemical industries in Egypt, and in the case of sulphuric acid it was concluded that, although the principal raw materials would have to be imported, such a factory could scarcely fail to be a source of profit and of great advantage to the country. Inquiry into the possibilities of cement manufacture involved a large amount of chemical work, and the despatch of an expert to the Sudan to study the whole question on the spot. As a result it is satisfactory to note that a cement factory is now being constructed at Makwar in the Sudan, where 50,000 tons of cement per annum will be made, the fuel difficulty having been overcome by using a mixture of locally made charcoal and imported coke.

Advice was also given during the coal shortage of the use of local oil for gas manufacture, with satisfactory results in both Alexandria and Cairo.

It is interesting to note that the Department has frequently given technical advice to private firms who are engaged in, or who propose to establish, chemical industries. This applies especially to purely Egyptian firms, some of which are small and possess only limited resources. Evidently the Government is alive to the importance of encouraging as far as possible the application of chemical science to arts and manufactures.

Special Research Work

One of the chief effects of the war has been the thorough establishment of the value of the research chemist to the community, and during the last few years research work may

be said to have taken its definite place in the programme of this department. In this connection, probably the most important to the future of Egypt is work done on Egyptian crude petroleum, with the idea of deciding the best methods of obtaining products which can be manufactured on an increasing scale in the Government refinery to be erected at Suez.

Briefly, the results so far have proved that it is commercially possible to obtain large yields of an excellent Diesel fuel oil, besides the customary petroleum spirit and kerosene, and also a pitch which will be invaluable for road making in the country or a good still coke for foundry purposes. The troubles in distillations arising from the presence of salt water and the very refractory emulsions in some of the local oils, are also being investigated, as they are pre-eminently connected with economical refining. Electrical separation of these emulsions under high voltage currents has given promising results, whilst other methods are being tried; but, as further work is proceeding apace on all this research work, which will form the subject of special report, we must await their publication for further particulars.

The director explains the need of industrial research playing a more important part in the country in future, and, above all, the need of a thoroughly up-to-date scientific library for general reference.

The report closes with a list of scientific publications by members of the staff, which alone proves the activity of this department.

Assay Office

Since the last report this office has been thoroughly recognised and put on a sound footing, and it is safe to say that, whereas in 1912 the equipment and scope of the Assay Office left much to be desired, now it is a very efficient department and an important factor in the safeguarding of the community against fraud.

In addition to Cairo, there are now only three branch offices—Alexandria, Tanta and Beni Suef—instead of nine, a change which has produced every satisfaction owing to the greater efficiency obtained.

The assaying and hall-marking work has increased enormously owing to the Assay Law No. 19 of 1916, making the hall-marking of gold and silver wares compulsory (provided the finenesses are not less than 15 carats and 60 per cent. respectively). Wares below these limits are not hall-marked, but the actual fineness number must be clearly stamped by the jeweller, and all plated goods marked as such by the maker, whilst recognised foreign hall marks are accepted without re-stamping. The Egyptian Government Assay Law deserves to be more widely known, for there is still a belief, especially among newcomers to the country, that hall-marking is not essential, and, in consequence, this is still taken advantage of. This law has proved very satisfactory, but is being overhauled, and future legislation will include a better system of inspection and the control of pawnbrokers and public jewellery weighers, both being only allowed to deal with hall-marked articles, the idea being to assist in gradually getting all the old gold and silver articles in the country properly marked.

The report gives an interesting account of all the old marks of assayers back to about 1890, and also the new standard hall-marks. These latter will soon be printed and published, to assist in the education of the masses and to help safeguard them against fraud.

Considering the importance of the jewellery trade in Egypt, where mistrust of banks still exists, and the amount of jewellery still largely represents the savings of individuals, the value of this law and the work of the Assay Office is very great. Incidentally, the amount of precious metal passing through the Assay Office, and the assay dues received, afford a very fair guide to the savings of the masses and the prosperity of the country. It is pleasing to note that, in spite of the fees for assaying being reduced by 50 per cent., the revenue has increased enormously. The figures for 1914–15 show clearly the period when money was scarce and some disquietude existed. So much so that the Assay Office worked out a scheme for the voluntary sale to the State of gold jewellery to facilitate the payment of taxes and to protect the public against unscrupulous persons who were trading on the panic that existed. Although this scheme only lasted 19 weeks, gold to the value of £18,427 was purchased.

As a guide to the prosperity of the country during the period under review, the following figures are interesting :—

	Assay dues.	Value of gold and silver received.	Value of gold alone.
Jan.–Dec., 1913	£3,616	£100,051	£93,128
Jan.–March, 1914	924	25,300	23,400
1914–1915	1,914	46,800	42,300
1915–1916	3,502	102,074	97,200
1916–1917	17,650	1,070 646	1,022,296
1917–1918	29,644	2,044,408	1,944,418
1918–1919	31,719	2,212,954	2,106,482

An entirely new method of assaying gold was devised by one of the staff in 1916, which has worked with every success, though all articles found below standard are re-assayed by the old furnace method, owing to the difficulty of explaining any new technical method before a court, this latter method being the recognised one of jewellers and gold-smiths in Egypt, of whom there were 2,232 in March, 1915.

In spite of the absence of higher chemical training in Egypt, it is interesting to observe that Egyptians form a very noteworthy proportion of the whole technical staff of the Government Analytical Laboratory and Assay Office—viz., 66 per cent.—whilst of the total establishments they form 86 per cent. Every endeavour has been made by the director to employ Egyptians, and he emphasises the value and opportunities for more attention being devoted in the future to the study of chemistry.

Export of Chemicals

A DEPUTATION representing the British Chemical Trade Association was received at the Board of Trade recently by Mr. P. W. L. Ashley, C.B. The deputation was informed that the present Export Restrictions relative to chemicals and dyestuffs, with the exception of fertilisers and other products the restrictions on which have been continued by Statute, would lapse upon the legal termination of the War. If, however, it should be found necessary to continue export restrictions on classes of commodities in which the Association is interested the Department promised to meet representatives of the Association again. In connection with applications for export licences for dyestuffs, it is understood that the Department will continue to relax, as far as possible, the condition requiring "manufacturers' certificates" in the case of dyestuffs of which there is clearly no shortage to domestic consumers and which can be freely purchased on the market.

The deputation was informed that, as already announced, it is the present intention to introduce into Parliament, after the recess, a Bill to give the Government power to enforce import restrictions on certain commodities. The deputation were assured that, in the event of Advisory Committees being set up to assist the department in respect of issue of licences due consideration would be given to the importance of the merchanting interests concerned.

Dangerous Drugs

THE Home Secretary announces that under the Dangerous Drugs Act, 1920, which came into operation on Wednesday, the import and export of opium, medicinal opium, morphia, diamorphine (heroin), cocaine, and ecgonine are prohibited, except under licence of the Secretary of State. The prohibition extends to the salts of morphine, diamorphine, cocaine and ecgonine, and any preparation, admixture, extract or other substance containing not less than one-fifth per cent. of morphine or one-tenth per cent. of cocaine, ecgonine, or diamorphine. From last Wednesday the import and export of raw opium is only allowed through the ports of London and Liverpool. Regulations regarding the marking of packages containing raw opium were given in our issue last week. The import, export, manufacture, sale or possession of opium prepared for smoking is absolutely prohibited.

Books Received

CATALYSIS AND ITS INDUSTRIAL APPLICATIONS. By E. Jobling. Second edition. London: J. & A. Churchill. Pp. 144. 7s. 6d. net.

A KINETIC THEORY OF GASES AND LIQUIDS. By Richard D. Kleeman. New York: John Wiley & Sons, Inc. London: Chapman & Hall. Pp. 272. 16s. 6d. net.

MODERN EXPLOSIVES. By S. I. Levy. London: Sir Isaac Pitman & Sons, Ltd. Pp. 109. 3s. net.

The Nitrate Industry

Production and Consumption During 1913-1919

The Imperial Mineral Resources Bureau in a Pamphlet entitled "The Mineral Industry of the British Empire and Foreign Countries" (H.M. Stationery Office. 9d.) give a summary of the production and consumption of nitrates during the period 1913-1919, from which the following abstracts are taken :—

The world's chief producers of nitrate, excluding synthetic nitrate, are Chile and India. A considerable amount is produced also in Egypt, but the total output is not known definitely. The figure for Egypt given below is the output of one company only. There has also been a small output in the Sanjak of Konia, Turkey, presumably from nitre earths of the kind worked in India.

The outputs of Chile, India and Egypt for the period under review have been as follows, in metric tons* :—

—	1913.	1914.	1915.	1916.	1917.	1918.	1919.
Egypt (*a*)	4,740	3,370	4,271	3,950	4,347		
India (*b*)	14,698	15,742	18,394	25,465	21,632	25,145	
Chile (*a*)	2,773,552	2,464,420	1,763,639	2,914,542	3,013,517	2,841,198	1,672,374

United Kingdom

The nitrate of soda imports into the United Kingdom during the period 1914-1918 were as follows :—

Year.	Quantity.	Remarks.
1914	199,000 tons	
1915	285,000 ,,	
1916	388,000 ,,	Government account only.
1917	247,000 ,,	Government account only.
1918	526,000 ,,	(Including about 55,000 tons on private account.)

The exports from the United Kingdom increased considerably in 1915, when Russia was dependent very largely for supplies on Great Britain. But after that year, with an ever-increasing demand at home, the exports dropped to practically nothing.

The large increase in the imports of saltpetre came entirely from India, giving a great impetus to the industry in that country.

Egypt

Nitrate of soda is obtained from the Esna shales in the Quena district. From the available information, these shales appear to contain about 1 per cent. of nitrate of soda mixed with large quantities of common salt. The dampness causes the salt to effloresce, and the rural population in the vicinity utilize it as a fertilizer in its impure state.

As already stated the production shown in the above table represents the output of one company only. A considerable amount is collected by numerous cultivators, and no definite information is available as to the total output.

Union of South Africa

Nitrates have been reported from all the more arid districts of the Union, but upon investigation they have so far proved to be merely cave fillings resulting from colonies of rock rabbits, bats and baboons.

In the districts of Prieska and Hay, nitrates, essentially potassium nitrates, occur at a large number of places within the limits of the ferruginous shales of the Lower Griqua Town Series, usually inclined at low angles, and lying along the basal portion of thicker krantzes, often associated with caves, recesses, and other places protected from rain. Nitre is also found as incrustations and irregular pockets or short veins on joint faces, bedding planes, &c., as well as in yellow layers, usually where the strata are more thinly bedded. Much attention has been given recently to the question of the development of these nitrates of the Prieska district, but the officials of the Union of South Africa Department of Mines take the view that the deposits are not rich enough to make their exploitation on a large scale a commercial success. Small amounts have been obtained at various times for local uses, but no production figures are available.

The Imperial Mineral Resources Bureau has recently (June, 1920) received a report from the Inspector of Mines, Pretoria, in which he states that the efforts lately made to produce nitrates on a large commercial scale from the Prieska shales have proved a failure. Over a hundred tons of rock were treated at Spitzkop for a recovery of about two tons of saltpetre, the cost being excessive and resulting in a large loss. The work initiated at Kloof, thirty-four miles north of Prieska, has been suspended; and, with the exception of a few tanks, all the elaborate and costly plant has been removed. A little undercutting has been done at the base of the cliff, but not to any large extent. Most of the nitre was obtained from the outer 12 in. of crust; and at a depth of 4 ft. or 5 ft. the yield amounted to only about 1 lb. of saltpetre per ton of rock.

Canada

Nitre has been found in small quantities as a white granular powder in travertine in the Quesnel Mining Division, British Columbia, and appears to have been formed recently by the decay of organic matter. No production of mineral nitrates is reported from this or other localities in Canada.

India

Potassium nitrate has been produced in India from very early times. For long the trade was a monopoly of the East India Company who were under an obligation to supply the British Government before other consumers. The trade has always been subject to extreme fluctuations, the trend of political events having a direct effect on it. It attained its highest values from 1860 to 1864, at the time of the American Civil War, for at that period saltpetre was an essential constituent of explosives, and India had practically a monopoly of supplies. The average annual exports then amounted to over 30,000 tons, but the development of the South American nitrate industry caused the Indian trade gradually to decline and exports had fallen to 13,000 or 14,000 tons per annum, in the years immediately preceding the war. The war period witnessed the usual stimulation of the trade.

The most important centre of production is the Bihar section of the Gangetic plain. Here, an agricultural population of over 500 per square mile supplies an abundance of organic nitrogen, the climatic conditions are ideal for the growth of the so-called "nitrifying bacteria," the soil around the villages is well-stocked with potash from the universal use of wood and cow dung for fuel, and the continuous surface desiccation following a small rainfall, causes the subsoil water to bring to the surface an efflorescence of salts in which potassium nitrate is conspicuous. Saltpetre is also extracted in the United Provinces and in the Punjab, while small amounts are imported from Nepal every year.

The system of manufacture consists in dissolving out the mixed salts from the surface soil collected around the villages, and in effecting a rough separation of the sodium chloride and potassium nitrate. The latter is sent to refineries for purification before export. The manufacture is controlled under licences issued by the Northern India Salt Revenue Department and the first portion of the work is done by a special caste which carries on the operations as an hereditary profession.

The crude nitrate earths contain on an average about 3 per cent to 5 per cent. of saltpetre. The crude product of the Bihar and United Provinces yields 40 per cent. to 50 per cent. refined saltpetre, the Punjab crude about 30 per cent. Of especial interest and importance are the various suggestions which have been made in recent years with a view to increasing the sources of supply and improving the methods of production.

Chile

With regard to Chilian nitrate, the present report quotes from the Final Report of the Nitrogen Products Committee which was noted in THE CHEMICAL AGE at the time of its publication.

A *Reuter's* message from New York states that although the British Government's reply to the American Note requesting information on the reported ANGLO-FRENCH POLICY REGARDING OIL supplies in Asia Minor was so badly mutilated in transmission as to be incomprehensible, it is believed to have conveyed the assurance that the British Government proposed to administer its trust without favour to any Government.

* The metric ton, long ton, and cwt., are equivalent to 2,204 lbs., 2,240 lbs. and 112 lbs. respectively.

(*a*) Sodium nitrate. (*b*) Potassium nitrate.

Union or Disunion

To the Editor of THE CHEMICAL AGE

SIR,—Your writer's article on "Union or Disunion" is interesting, not so much for what it says, as for what it does not say. He does not approve of a liaison with labour—and yet such a liaison has its uses. A story was once told me of how the chemists of a certain large works in the Midlands, being very dissatisfied with their pay and conditions of labour, and having been refused repeatedly the necessary improvements by the directors of the concern, joined *en masse* the Union which controlled the industry. The chemists' case was put before the local Union officials, who agreed that some alteration was necessary and promised the support of the Union if the chemists, on presenting another request for better conditions, were again refused. The chief chemist approached the directors, and was again refused in a very peremptory fashion. Taking his departure from the director's office he turned, and, more in sorrow than in anger, informed his principal that unless the chemists' demands were conceded within a certain specified time all the hands in the works would down tools. Naturally there was an explosion on the director's part. An explanation ensued, and the result was that all the chemists' demands were conceded without resort to the stronger measures threatened. The story is not without a moral!

Speaking of the B.A.C. and its methods of election to membership on the sufficient standard of education clause, your writer says "in the absence of a minimum requirement one's best 'open sesame' is often a good friend." That surely is not so! I should like to ask your contributor however, whether he has not heard of the good friend acting under the Institute of Chemistry's jurisdiction? I have, and I daresay that other of your readers have too! Your writer would define the chemist as "a man who has the A.I.C. or F.I.C. qualification"—no other is the genuine article. Apparently the newly fledged A.I.C. is more of a chemist than the man who holds a responsible position in chemical industry, and has been practising as a professional chemist for seven years. Evidently if a man cannot afford a college training he is no chemist, no matter how many years he has spent on evening study at highly organised, efficient and approved, technical schools—no matter how efficient a manipulator he be, &c., &c. The only advantages which the college training yields is that the college trained man has more time on his hands, and that he gets his knowledge in easy stages. Providing the student has the average amount of common-sense he cannot help passing his examinations, every help being extended him and his path made easy by the University in which he is studying. The non-collegiate student who has a definite aim in his evening study and goes about his business seriously and studies intensively, never apparently reaches the dizzy heights of knowledge attained by the other student, and so, therefore, can never be a chemist. I remember, and it is only as recently as six years ago, that one could often read the legend in the vacant situations column that "no university graduate need apply."

That the average successful qualified man seems largely to have neglected the B.A.C. may be so, but it is only because of our individuality or selfishness. As chemists we have been much lauded for our individuality in research, &c., but in matters affecting the profession as a whole and its members our individuality is damned. The successful chemist, unlike his medical, legal, and other professional *confrères*, does not care what happens to his less fortunate brethren.

Your correspondent's suggestions appear to my mind to be on the whole unworkable. There can be but one body, and one body only, to represent chemists (using the term in its broadest sense) and all chemists to make the body economically possible must be members. Chemistry must be a closed profession, but before closing it the body, which preferably should be the B.A.C., must admit all practising members of the profession on its present standards of election. The young men who have not been in the profession long enough, and cannot in other ways be regarded as eligible for membership of the B.A.C., should proceed to entrance *via* some examination like that of the Institute of Chemistry. Let the Institute of Chemistry retain its Charter and continue in its present useful work, but the B.A.C., which I trust some day to see absorbing all the eligible members of the other organisations, must be the active trade union association for the profession.—Yours, &c.,

ALEMBIC.

Artificial Silk

To the Editor of THE CHEMICAL AGE

SIR,—In the "Society of Chemical Industry Review" for August 15, 1920, an article was contributed by Mr. L. P. Wilson, of Messrs. Courtaulds, Ltd., in which reference was made to the artificial silk manufactured by the British Cellulose and Chemical Manufacturing Company, Spondon, in such terms as to convey an impression detrimental to the latter.

I would not trouble you, were it not for the fact that the erroneous statements in this article have been widely quoted in the daily press, and curiously coincide with rumours which have been circulated in a less public manner.

When serious and specific statements are published regarding the cellulose acetate silk produced by the British Cellulose Company we are at least entitled to demand that criticism should be based on knowledge and experience of the product.

The merits of the silk in question may be relied upon to establish its legitimate position in the industry, and I only desire to point out that the silk produced by the British Cellulose Company surpasses in many respects that produced by other methods.

This is notably the case in regard to its resistance to moisture, as can be easily ascertained by pressing the two kinds of silk against the moist tongue; the old type of artificial silk, so to speak, melts right away, whereas the new product remains resilient and strong with its textile qualities preserved. In fact, the true elasticity of the silk, maintained in both wet and dry state, is one of its remarkable assets, since it affords a range of textile effects not hitherto attained by any artificial silk.

It causes the silk to work in the loom without any breakages, even more regularly than natural silk, and is therefore highly appreciated by the weaver, who can use the new product not only for weft but also for warp. This quality, moreover, enables the silk to be spun in very much finer counts than have been commercially possible with the older varieties of artificial silk.

Finally, I desire to place the fact emphatically on record that, contrary to Mr. Wilson's statement, the acetate silk produced by the British Cellulose Company can be easily and cheaply dyed, is actually being dyed, and has been publicly exhibited dyed, not only with the Basic colours, but also with the entire range of Direct colours, the Vat colours and the Sulphur colours, in fact, with any and all of the dyes which are applicable to other artificial silks, both alone and in union with cotton.—Yours, &c.,

J. F. BRIGGS, A.C.G.I.

Industrial Alcohol

To the Editor of THE CHEMICAL AGE

SIR,—I note that in the British Association discussion on industrial alcohol a remark of mine was taken to mean that the Skinningrove works could make 23,000,000 gallons of alcohol from ethylene in a year. This should be that the process, if applied to the whole of the coal coked in ovens in this country, would yield that quantity. It was my way of expression that was at fault, not the reporter.—Yours, &c.,

Department of Applied Science, (University of Sheffield), August 31, 1920.

CECIL H. DESCH.

Sulphate of Ammonia

OWING to the increase in railway rates from September 1, the Ministry of Agriculture has been obliged to sanction an increase in the agreed maximum prices for sulphate of ammonia (announced in its notice F.P. 506/S.1) by 3s. 6d. per ton in the case of all deliveries made on or after September 1, except when such deliveries are in fulfilment of existing unconditional contracts for delivery at the original prices. The original maximum prices will also remain in force for deliveries made ex-works or by road. A leaflet explaining these alterations is being printed, and will shortly be obtainable, post free on application to the General Secretary, Ministry of Agriculture, 72, Victoria Street, London, S.W. 1.

British Association Meeting at Cardiff

Concluding Reports of the Chemistry Section

We give below the concluding portion of our Report of the Chemistry Section of the British Association at Cardiff, which came to an end on Saturday.

Lubrication and the Germ Process

In a paper on the above subject, read before the Chemical Section on Wednesday, August 25, Messrs. H. M. Wells and J. E. Southcombe pointed out that the modern view of lubrication on the physico-chemico side was that a residual valency or affinity existed between the oil and the solid surfaces of the bearing and journal. The problem had, therefore, to be considered as a kind of intimate relationship between the oil and the metal. This was quite a different view from that held by investigators in the past, who thought that the property of "oiliness," so strongly manifested by fatty oils as compared with mineral oils, resided in some particular physical characteristic of the oil itself.

The authors claimed to have discovered the "reason" why the fatty or fixed oils possessed superior friction-reducing properties to that of mineral oils. They showed that this was due essentially to the presence in fatty oils of minute quantities of free fatty acids, which were absent in the majority of mineral oils. In consequence of this discovery, they added small quantities (about 1 per cent.) of fatty or organic acids, which were easily accessible and relatively cheap, to mineral hydro-carbon oils. The products so obtained possessed remarkably low frictional coefficients. As an example, the addition of 2 per cent. common fatty acid to a mineral hydro-carbon oil reduced the coefficient of friction shown by this oil on a friction testing machine from 0·0084 to 0·0052, a diminution of 26 per cent. By suitably choosing the type of fatty acid to be added to mineral oil the behaviour of oils in the presence of water and other contaminating substances can be modified at will. It was also shown that the risk of metallic corrosion was even less with these oils than with the usual compounded oils, because the latter frequently developed in working notable quantities of free acid.

The principle of making mineral lubricating oils possessing increased frictional reducing properties by adding to mineral oils suitably chosen fatty acids in relatively minute amounts had been patented throughout the world, and had been somewhat fancifully called the "germ process," because the fatty acid was the germ of the idea. The value of the process lay in the fact that oils possessing friction-reducing properties much superior to mineral oils could be prepared at relatively little extra cost to mineral oils. Secondly, by this means an immense quantity of fatty oil suitable for the manufacture of margarine and other foodstuffs was liberated for the country's needs, and substituted by a much smaller amount of commercial fatty acids, which were quite unsuitable for food and were more or less in the nature of a by-product. Finally, it might enable the lubricating oil manufacturer to produce the highest class of friction-reducing oils from comparatively thin, therefore cheaper, mineral oils, and incidentally this might have the utmost significance to-day, when we were striving to foster and develop the mineral oil production of our own country and the Empire.

Discussion

Mr. A. E. Dunston said he had been engaged for some time investigating mineral lubricating oils, considering them from the point of view of the refiner rather than of the user. Two years ago he discussed before the Institution of Petroleum Technologists the question of the effect of the customary acid refining on the properties of heavy mineral oil, and showed the remarkable action which strong sulphuric acid had as a refining acid on the physical properties, although the effect was less on the chemical nature of the oils. The net result of the acid treatment, as shown in his tests, was a striking diminution of viscosity, a fall in specific gravity, an increase in the mean molecular weight, and an increase in the ratio of carbon to hydrogen, this result being obtained with a straight mineral oil treated with two volumes of 3 per cent. oleum. When considering the action of strong sulphuric acid it was necessary to bear in mind the conclusions of Brooks and Humphrey two years ago, who showed that the result of using strong sulphuric acid cold on a mineral oil was, as a general rule, the formation of a very black viscous tar, which in a very short time would set in a solid mass. These investigations also showed that when pure olefines were treated with strong sulphuric acid, there was no formation of tar. The olefines tended to be polymerised, having a light molecular weight.

Therefore it did not appear at first sight that the refining action of sulphuric acid on mineral oils was merely the elimination of the olefines. He felt it was necessary to emphasise the lamentable ignorance which existed as to the chemical nature of mineral oils. Beyond the components of petrol, practically nothing was known, with the exception of a few members of the paraffin series. In the case of lubricating oils, no one identity had yet been properly formulated, and it was for this reason that they were at a loss to understand the refining action of strong sulphuric acid. The practical refiner used sulphuric acid largely to produce a good colour, but he believed the current view among refiners was that excess of acid was probably detrimental to the lubricating value of the finished oil, although it gave a good colour. He had also investigated the iodine values of oils, upon which a vast amount of work had been done, and had been able to show how the iodine value varied with time reaction. He wished to put forward for discussion this point of view. There were in a heavy mineral oil substances which were removed by strong sulphuric acid, substances which had a distinct iodine value (and even after prolonged treatment the iodine value was still in existence), substances which, so far as he knew, had never been reduced. Was it possible that the hydro-carbons in these heavy mineral oils contained such a ring which would open up under the influence of acetic acid? Were the so-called unsaturated compounds in lubricating oils attackable in this way? Were they really not unsaturated, but in the nature of a ring, which might be opened up in the way he had suggested?

Mr. H. T. Tizard, speaking from the physico-chemical standpoint, thought a rather interesting stage had been reached in the history of lubrication. Up to very recently the value of a lubrication oil had been measured in terms of its viscosity, but now there had been an entire swing of the pendulum, and some people said that viscosity had nothing to do with it, and that the lower the viscosity the better. It was known that viscosity in itself was not a measure of the quality of a lubricating oil, but there was no known laboratory method by which the quality of a lubricating oil could be measured. From the physico-chemical point of view, a good deal of work had been done by Langmuir and Parkins in America and by Hardy in this country, which went to show that what was really wanted, and what was really obtained in a lubricating oil, was the formation of a strongly adsorbent molecular layer on the surface of the metals. The quality of the oil really depended on the strength of adsorption of this layer, and it also had not been sufficiently emphasised, on the thickness of the adsorbing layer. There was a good deal of evidence that a layer one molecule thick was sufficient, but he did not think that evidence was decisive. In his opinion, the layer must be thick enough to prevent molecular attraction between the metallic particles of the two surfaces which are being lubricated, and viscosity in that case had nothing to do with it. What Messrs. Wells and Southcombe's results really came to was that there was a small quantity of fatty acid in the lubricant. There was, for instance, a molecular layer of one molecule in thickness of oleic acid on the surfaces which was adsorbed in the main lubricant; but he did not know of any mechanical experiments which really measured the frictional coefficient with different types of lubricant at different viscosities.

It had been emphasised by Messrs. Wells and Southcombe that the quality of a lubricant could be obtained

by measuring the interfacial tension between lubricant and water. What was really necessary, however, was to measure the interfacial tension between the lubricant and the metal, and if a scientific method of doing this was available it would be of the greatest importance. His own view was that the method put forward by Messrs. Wells and Southcombe of measuring the interfacial or surface tension was not a practical method. They had certainly shown that the addition of fatty acids improved the quality of the oil, but what was wanted was a scientific and practical method of measuring the quality of the oil in the laboratory. If they measured the interfacial surface tension between mercury and lubricants by the drop method—by counting the number of drops of mercury—very curious results were obtained. When dropped through castor oil the drops of mercury remained intact at the bottom of the vessel, like so many lead shot, thus showing that the surface layer of castor oil was sufficient to prevent the drops of mercury coming within the range of molecular attraction. Using glycerine, the mercury drops coalesced almost as soon as they fell, showing that the film, if there was a film, was too thin to keep the drops outside the range of molecular attraction and therefore this oil was no good as a lubricant. Hardy's experiments bore this out, and yet the viscosity of castor oil and glycerine was about the same.

Mr. S. R. Illingworth said he had had to refine oils from most parts of the world, particularly topped oils and not so much lubricating oils, and on many occasions he had noticed a remarkable re-activity of oils towards metals. On one occasion, in running an oil through a copper still, after acid treatment and refining, the oil being absolutely free from sulphuric acid and sulphonates, and free also from sulphur in the oil itself, the oil left behind in the copper still was a residue containing over 2 per cent. of copper. He had also found the same thing with a number of other metals. He came to the conclusion that this effect was due to some very high naphthenic bodies in the oil, and that they were reactive with metals. Another interesting point with these oils was that the more reactive with metals they were the more their lubricating properties persisted over a fairly high range of temperature, a far greater range of temperature than other oils which were not reactive. He thought it would be a profitable line of research, not only as regard refining, but also as regards the lubricating properties of oils, to consider whether molecular naphthenic compounds do actually occur, and whether valuable use could be made of them. It was a question of residual valency, or a definite chemical action of the first order, between the lubricating oil and the surfaces with which it came in contact.

Mr. Southcombe, replying to Mr. Tizard, said he had reason to assume that molecular attraction of the metal surfaces was of a vanishing order. As to the thickness of the film, Langmuir had carried out some experiments in this connection which went to explain the reason for the effect mentioned by Mr. Tizard when dropping mercury through castor oil and glycerine. At the same time, it would be interesting to know if the castor oil used by Mr. Tizard was acid free.

Mr. Tizard said it was oil used in aero engines, and therefore as pure as it was possible to get it. His point was that the film in the case of castor oil was larger than in the case of glycerine, and that interfacial tension was not a guide at to lubricating qualities.

Tungsten

Mr. Julius L. F. Vogel, in a paper on Tungsten, said that probably 95 per cent. or more of the total output of tungsten ores was consumed by steel makers for the manufacture of high-speed tool steel. The direct reduction of very pure wolfram yielded ferro-tungsten which was suitable for most purposes; but, unless a very pure ore or concentrate could be obtained, the product was likely to be high in objectionable impurities. For this reason it was necessary to prepare pure oxide of tungsten by chemical processes and to reduce this to the metal, the powder thus obtained containing 96 to 98 per cent. of tungsten. The other ore which came into commerce (Scheelite) was usually pure; but its direct reduction to metal had the disadvantage that the resulting tungsten was apt to contain lime, which was an objectionable impurity. The reduction of the tungstic acid took place in crucibles, very intimate mixture with the reducing agent and slow cooling out of contact with air being essential. The process was one which demanded strict laboratory control.

Tungsten powder was made almost exclusively in Germany before the war, and in August, 1914, the great scarcity of the metal was realised by the manufacturers of high-speed steel. A proposed Government scheme for conducting the manufacture in this country proving unworkable, a number of the largest firms combined to establish a factory, and a satisfactory supply of the pure metal was maintained during the war. The industry, Mr. Vogel said, was now firmly established, but the effects of Continental competition were beginning to be felt, and some measure of protection for an important key industry might be called for. It might be noted that the consumption of fuel had been halved in four years. The paper contained a number of typical analyses.

Ductile Tungsten

Prof. C. H. Desch, in a paper on the above subject, stated that the properties to which the metal tungsten owed its importance, apart from its use in the production of alloy steels, were its high melting point of 3,350°C. and its great ductility and tensile strength when drawn into the form of fine wire. These properties had led to its almost universal adoption for the filaments of incandescent electric lamps. The ductile metal was prepared from the powder, which was pressed into rods and then made compact by heat, the particles being sintered together by the passage of an electric current. Even in this condition it was quite brittle, and ductility was only obtained by swaging at a very high temperature after heating in hydrogen. The swaging was followed by drawing, the metal becoming progressively more ductile until it could be bent or drawn cold. The tensile strength of a wire 0·0011 in. in diameter was nearly 270 tons per square inch.

Tungsten, Professor Desch said, differed from other metals in being more ductile when cold after severe working and deformation than in the annealed condition. The possibility of drawing tungsten cold depended on the grain size of the original sintered ingot, and it was the practice to examine every ingot microscopically, all those ingots being rejected which showed more than a certain limiting average grain size. The grains grew on long exposure to high temperatures, as when used in lamp filaments, and in order to prevent this growth from becoming excessive, and so rendering the filaments brittle, a small quantity of thorium oxide was mixed with the tungsten powder in making the original ingot, and the infusible and non-volatile particles of this oxide presented an obstacle to the growth of the grains.

Electrolytic Zinc

Dealing with the subject of "Electrolytic Zinc," Mr. Samuel Field said that during the past few years considerable attention had been given to the possibility of the establishment of an electrolytic zinc industry in Great Britain. As a result of this work, it might be stated with confidence that British electrolytic zinc was now an economic proposition. Research work had been carried out at Swansea during the past four years. In the later stages, in a 1½ ton per day plant, over 120 tons of metal had been produced, which commanded an appreciable premium over the ordinary spelter, and demonstrated (1) that the electrolytic product was a certainty from even the complex ores available in the country, and (2) that the process could be carried out with much greater efficiency and less cost than that of distillation. The outstanding advantages of the method were: (1) The high purity of the product, ranging up to 99·95 per cent. zinc and over; (2) high recovery; (3) the almost entire mechanical handling from ore to ingot, thus eliminating excessive labour cost; (4) the easy concomitent recovery of accompanying metal values, such as lead and silver; and (5) the availability of large resources of home ores (which, by reason of their complexity, were not amenable to distillation), thus ensuring an established home production of a metal so largely used in the galvanising industry, in which Great Britain once occupied the premier position.

Outline of Process

Mr. Field, in a brief outline of the process, stated that the ores or concentrates suitably crushed were calcined, sulphur being recovered as sulphuric acid or other sulphur product. The calcination was designed to meet the special requirements of the later operations, and thus markedly differed from that

followed in the case of distillation. From the calcined product the zinc was extracted with the acid zinc sulphate liquors from the electrolytic cells. The liquor was reduced to low acidity by means of the ore, and then completely neutralised by available waste zinc products or by whiting. An important point in the process was the prevention of gel formation from soluble silice, thus completely surmounting a difficulty still experienced in established electrolytic zinc works. The liquors were separated from the insoluble residue (which contained the lead and silver), and the crude zinc liquor now contained about 10 per cent. of zinc, together with small amounts of impurities, such as arsenic, antimony, copper, cadmium, iron, nickel and cobalt. The effect of each of these impurities on the process of zinc deposition had been carefully studied. Each of these impurities, even in very small quantities, had a most detrimental effect in the electrolysis of acid zinc sulphate liquors.

One of the chief problems of electrolytic zinc was the elimination of these deleterious impurities down to harmless quantities. New methods of purification had been worked out for each impurity, and methods were available for their removal in two stages, or even in a single operation. When present in sufficient amounts, copper and cadmium were recovered as well as eliminated, and provided additional sources of revenue. The purified liquor now contained only exceedingly minute traces of cadmium, with nickel and cobalt each reduced to much less than one-part per million of liquor. The pure liquor was now acidified with outflowing solution from the cells, bringing the composition to approximately 8 per cent. zinc and 3 per cent. acid, and electrolysed between lead anodes and aluminium cathodes. In this operation, the average cell P.D. was 3·5 volts or less, with current efficiency of about 90 per cent. giving an energy consumption of 3,200 units per ton of cathode zinc. The zinc content of the electrolyte was brought down to 3 per cent. or less, with an increased acidity up to 10 to 11 per cent., and this liquor was used cyclically for the extraction of zinc from the calcined ore, and for acidifying the pure zinc sulphate solution prior to electrolysis. The electrolysis of acidified zinc sulphate solution was attended by insuperable difficulties, except when pure liquors were employed, and the preliminary purification process constituted, therefore, the most important stage in the cycle of operations. The cathode deposits were allowed to grow up to two days, with a current density of 25 to 30 amperes per square foot. They were sound and compact, and readily detached from the aluminium sheets, and after rinsing were melted down to ingots containing more than 0·02 per cent. cadmium, 0·02 per cent. lead and 0·01 per cent. copper and iron.

Power Consumption

Electrical power consumption in the subsidiary mechanical processes was amply covered by an allowance of 800 kw.-hours per ton, giving an overall consumption of 4,000 kw.-hours per ton of zinc, approximately one-third to one-half of that required by the electrothermal method.

The residues from the extraction process contained all the lead and silver which were recovered as argentiferous lead by blast furnace smelting.

It can only be reasonably anticipated that, in addition to the well-known outlets for the metal, new and still wider fields would open up for a product, the purity of which could easily be guaranteed at 99·95 per cent.

Carbon in Organic Products

DR. R. V. STANFORD gave a brief account of—and later, at the Mental Hospital, demonstrated—a method for the estimation of minute quantities (fractions of a milligramme) of carbon in organic products.

This method involved a new principle in organic combustion. It was well known, the author stated, that in the ordinary process of combustion the carbon percentage found was usually low, and it had been shown that the gases passing through a combustion apparatus always contained carbon compounds other than carbon dioxide. This source of error was eliminated if the products of combustion were circulated through the combustion tube for a sufficient period before being collected. Once the necessary apparatus was set up the combustion was practically automatic, requiring only a few minutes' skilled attention at intervals.

Another method, described by Dr. Stanford, was one for the estimation of minute quantities (fractions of a milligramme) of amino acids in organic products. This was a modification of the well-known method due to Van Slyke, the points of interest about the method being the very small quantities of the substance required and the handiness of the apparatus.

Researches on Atmospheric Pollution

In a short paper entitled "Researches on Atmospheric Pollution and its Measurement," Mr. J. S. OWENS dealt with the work of the Advisory Committee to the Meteorological Office on Atmospheric Pollution. This investigation, it was explained, had been carried on for five or six years, records being taken at some 25 or 30 stations in different parts of the country. An important part of the work was the record of the quantities of solid impurities in the atmosphere, but the most important matter from the chemical point of view had been the work of measuring the atmospheric acidity. This had to be dealt with in two ways; first, the gaseous acidity, and, secondly, the acidity which might be held in the suspended solid impurities. The first difficulty met with was that the quantities to be measured were so excessively minute that it became necessary to devise some method of measurement. The Committee had not altogether succeeded in doing that, and it was in the hope that the members of the Section might be able to assist that this paper was read. Diagrams were shown of several instruments which had been designed for measuring the gaseous acidity, the instruments being of glass, and consisting of an absorption tube and a comparison tube. Indigo carmine and ethyl orange had been used as the indicators. It was suggested at one time that Congo red should be used instead of methyl orange as being more sensitive, but it was found that Congo red was sensitive to CO_2, and as there was always CO_2 in the air, its use had to be abandoned. At the same time, in dealing with gaseous acidity in the atmosphere with the instruments which had so far been devised a considerable degree of accuracy attained, such as one part by volume in 20 millions, for instance. Even better results were suggested as possible with the same apparatus.

Still greater difficulties had been encountered in the efforts to measure the acidity of the suspended impurities. An instrument was devised for getting out the suspended impurities and measuring the acidity, but difficulties arose and it had to be abandoned. Other methods were adopted, including an electrical conductivity method, without much greater success, and the present position was, Mr. Owens said, that whilst he believed they had got a satisfactory instrument for measuring the gaseous acidity of the atmosphere down to a considerable degree of accuracy, they had not got a satisfactory method for measuring the acidity of the suspended solid impurities. One of the difficulties encountered with the electrical conductivity method was the provision of a suitable filtering medium, one which would be free from electrolytes, and would, therefore, have no influence on the conductivity. All the materials tried, however, were found to affect the conductivity to a greater or less degree, the most favourable being lactose. All the investigations, concluded the author, had been carried out at the Royal College of Science and he hoped the members of the Section would be able to suggest a way out of the difficulty.

Discussion

The PRESIDENT asked to what the acidity of the air was due. Was it sulphuric acid or hydrochloric acid? He imagined it it was not SO_2 for the reason that SO_2 in the presence of moisture and sulphite was rapidly oxidised as sulphuric acid. Was it in the form of an acid salt like sodium sulphate? It was always said that sodium sulphate was universally present in the air. Whether that was so or not he had not tried to discover, but it might help the discussion if they could be told in what form this acid was or what acid it was.

Mr. OWENS said that so far as they knew at present there was no likelihood at all of sulphuric acid, nor indeed of hydrochloric acid. Probably, in the vicinity of furnaces there might be SO_2 rapidly converted into sulphuric acid, but that was soon converted into sulphite through the amount of alkaline dust that was flying about. Most of the experiments so far had been carried out during the summer; the Committee was not ready to work last winter and perhaps in a London fog they might find free acid. He thought they would and it might be sul-

phuric acid. In the neighbourhood of chemical works there might be some hydrochloric acid. In the instrument for measuring the acidity of the gases, the air was not filtered because experiments carried out with a view to separating the solid matter from the air before testing had not succeeded in getting a complete separation.

The PRESIDENT asked if there was a body like ammonium sulphate present in the air. So much coal was burned in domestic grates that he thought there must be quite reasonable quantities of ammonia always escaping into the air.

Dr. DESCH thought the possibility of hydrochloric acid must be taken into account in some places. He was particularly interested in the rapid decay of the stonework of the Mersey Dock and Harbour Board buildings at Liverpool. This was probably due to the sulphuric acid from St. Helens, where it was being evolved rather freely. The decay of the stonework of the Houses of Parliament at Westminster must also be accounted for by the presence of the pottery works on the other side of the river where hydrochloric acid was evolved. Therefore, it might be worth while trying to find a specific test for hydrochloric acid.

The PRESIDENT, in proposing a vote of thanks to the author, said he was afraid the discussion had not helped the matter forward very much, but he hoped the individual members of the Section individually would give the matter their careful consideration and endeavour to assist if possible.

Absorption Spectra of Organic Compounds

The various theories advanced from time to time to explain the absorption bands exhibited by organic compounds were dealt with in a report of the Committee appointed to investigate the question (of which Sir J. J. Dobbie is the chairman), and the present position reached in the investigations fully explained.

Fuel Economy

In submitting the Third Report of the Committee appointed by the British Association for the investigation of fuel economy, the text of which was given in our issue last week (Pp. 235-8), Professor W. A. BONE outlined the work that the Committee had done during the year, and stated that at the Edinburgh meeting of the Association next year, it was hoped to present a fuller report on all the matters dealt with in the present one, and particularly to deal in a comprehensive manner with the question of coal outputs, and the compilation of the statistics relating thereto. It was really important to arrive at some accurate conclusions regarding output which were strictly comparable, and it was with this in view that the Committee had asked Professor Louis to prepare the memorandum given in Appendix I. of the Report (p. 236). Professor Bone then dealt at length with the position as regards the gas supplies of the country, and amplified the report on this matter. He related how during the war the gas undertakings of the country diluted their gas by extracting benzol and toluol, and how, as a result of that, a feeling developed in the industry that there should be greater freedom of action as regards the quality of gas which might be supplied for public use. The point upon which the Fuel Economy Committee found itself at difference with the industry was in regard to the proportion of carbonic oxide, and inerts generally which should be permitted in the interests of public safety. The Fuel Research Board in a Report which it issued early in the year proposed that a limit should be placed upon the inert constituents of public gas supply in conjunction with a change from supplying gas on the basis of 1,000 ft. to the basis of heating value, the unit being the therm or 100,000 B.Th.U. In this report the Fuel Research Board proposed a limit of 12 per cent. for the inerts, and the B.A. Committee agreed. It was also recommended by the Fuel Research Board that the sulphur content of the gas should be more completely removed, and that there should be certain other restrictions. So far as the removal of sulphur was concerned, he understood that the South Metropolitan Gas Company was now removing the sulphur to such an extent that their gas only had 8 grains per 100 cubic ft., and that it was anticipated in the near future to be able to remove the whole of the sulphur compounds.

The B.A. Committee, however, disagreed with the view which the gas industry had taken that it should practically be above all restrictions, and the point he specially emphasised was that after this first Report of the Fuel Research Board, a conference of gas suppliers and consumers was held—he did not know who represented the consumers—and certain modifications of the original proposals, with which the B.A. Committee had agreed, were made. For instance, the 12 per cent. of inerts had been altered for a graduated scale from 20 per cent. down to 15 per cent. after a certain number of years whilst the question of sulphur purification and sulphur dioxide and methane content of the gas was left out of consideration and put off for a future enquiry. In all this the B.A. Committee had been ignored with the result that a deputation from the Committee waited upon the then President of the Board of Trade (Sir Auckland Geddes) who was impressed with the point with regard to carbonic oxide and sulphur content of public gas supply, and had he continued in office he had reason to believe that something might have been done to give effect to the views of the Committee. However, the Gas Regulation Bill was introduced later, and these matters were left open to be dealt with at a public enquiry later, when he hoped that the B.A. Committee would have an opportunity of laying its views before that enquiry. As the position now stood, the Committee did not think it was at all a satisfactory one from the public point of view, and he felt that the existence of the Committee would be justified if it only looked after the public interest at the proposed enquiry.

Discussion

Mr. COSMO JOHNS said he was in agreement with Professor Bone on the question of the chemical composition of gas. In furnaces, for instance, it was of the utmost importance that certain chemical limits should be laid down. It might be that when burning gas in mantles another composition might be permitted, but certainly a limitation was necessary when using gas for industrial purposes. He would like some information as to the possibilities of suspending small coal in oil. Great success had been claimed in America with this, and it was particularly important to the anthracite area of South Wales where large quantities of fine anthracite coal had accumulated which was very high in fixed carbon. These accumulations were near the spot where the Anglo-Persian Oil Company was erecting its huge refineries, and it seemed a place where the study of colloidal fuel might be taken up. The whole secret appeared to be in the use of some substance which would keep the fine coal in suspension for a long period.

Dr. E. STANSFIELD said that in Canada, where he came from, they were working on similar problems but were handicapped by the lack of a sufficient number of trained workers to carry out the work. The Canadian Government was tackling the question of fuel economy, and in conjunction with the provincial Governments was dealing with the question of the utilisation of lignites. A big plant was being erected in Southern Saskatchewan for the low temperature carbonisation and briquetting of lignites, whilst a peat Committee was also at work. With regard to colloidal fuel, he had had the pleasure of meeting the inventor of that process, and one of his assistants had done a lot of work in the suspension of carbonised lignite in oil, and it had been found quite an easy thing to do. The possibilities of the process were very great.

Mr. S. R. ILLINGWORTH urged the necessity for classifying coals on a more scientific basis than that now adopted.

Sir R. ROBERTSON said he was greatly interested in the work being done with regard to the production of alcohol at the Skinningrove Ironworks. The estimate of the supply from these works was about one-tenth of the total used in this country at the present time, and he hoped that this quantity would soon be available. He presumed that in making the estimate, the larger quantity of ethylene in the Durham coal had been taken into account, and that it was not assumed that there was a uniformity of ethylene in all coals. The quantity in the South Wales coals was very much less than in other coals.

Professor BONE said that allowance had been made for that. The quantity of ethylene in some of the Yorkshire coals was even greater than in the Durham coal, although in South Wales it was rather small.

Dr. LANDER said that although he was now an official of the Fuel Research Board he spoke in his private capacity. So far as the consumers, who had been referred to by Professor Bone, were concerned in relation to the conference, they were represented by chemists and technical men from the railway companies, the large steel works, &c., and the conclusions that had been arrived at were considered a fair compromise, after

hearing eminent medical witnesses. So far as fuel economy generally was concerned, he would like to emphasise the immediate need for a proper fuel control in large industrial works. They all knew how plants, well designed, were frequently greatly deteriorated through there not being a proper person to look after them. That was particularly the case in regard to the textile trade, with which he was connected before joining the Fuel Research Board.

The PRESIDENT (Professor Heycock) said that he had been particularly struck by the remark of Professor Bone that the South Metropolitan Gas Company had succeeded in removing the sulphur down to only 8 grains per 100 cubic ft.

Professor BONE said the company was using the nickel process. By the old lime process the quantity was about 12 grains.

Professor BONE, replying to the discussion, said the Committee had the question of colloidal fuel under consideration. His complaint against the Fuel Research Board was that it had given the B.A. Committee no notice that the Conference he had referred to was to take place, and that was why the Committee had sent a deputation to the Board of Trade. If necessary, the Committee would take that course again. If it had not been for the work of the B.A. Committee, he did not believe the Fuel Research Board would have been formed as quickly as it had been, and he claimed that the views of the Committee should be given consideration. The Committee had offered its help to the Fuel Research Board, but he was sorry to say it had been declined. The Committee would much rather co-operate with the Board than apparently oppose it. The Committee did not raise these points for the sake of raising obstacles, but because it believed that the consumer needed protection.

Failure of Alloys at High Temperatures

Addressing the Engineering Section on the effect of temperature on some of the properties of metals, Professor F. C. LEA, said the use of materials, subject to stress at temperatures much higher than the normal in steam plants, internal combustion engines, &c., necessitated a knowledge of the effect of temperature upon the properties of the materials. It was by no means wise to assume that a material peculiarly well suited to meet certain conditions at ordinary temperatures was able to perform the same duty at higher temperatures. In the early days of the war it was found that a certain alloy of aluminium containing 13 per cent. of zinc and 3 per cent. of copper gave good results at ordinary temperatures, and it was suggested that it should be used for pistons of internal combustion engines. Failure ensued, and it was then found that the hardness and strength of this alloy changed very rapidly, so that at 300 degrees C. it was very weak and soft and quite unsuited to meet the conditions that obtain in a petrol cylinder engine. A very serious accident that happened on the Lancashire and Yorkshire Railway some years ago emphasised the same lesson, and in connection with the use of certain alloys for high pressure, or superheated steam valves, difficulty had been experienced. Another very important engineering and architectural problem, the construction of fire-proof buildings, would no doubt have been more adequately solved had greater attention been directed to the scientific investigation of the effect of temperature on certain metals.

Industrial Alcohol

Following the discussion on Industrial Alcohol the following resolution was passed: "That Section B requests the Council to recommend to the proper authorities the great desirability of continuing the experiments on the production of industrial alcohol now in progress by the aid of the installations now existing in Government establishments."

The death is announced from the Malay States, at the age of 37 years, of Mr. F. W. DAY, A.I.C., F.C.S. Mr. Day received his education at King Edward's School, Bath, and at the Royal College of Science, London. He was a B.Sc. of London University. After three years in India as a Government chemist he went to the Malay States, where he was appointed to the Agricultural Department of the Colonial Service, and about a year ago he became a research chemist to the Rubber Growers' Association of the Malay States.

The Coal Crisis

Strike Notices for September 25

The result of the ballot on the question of a miners' strike was received at a conference in London on Thursday, and after a short sitting it was decided that "cease work" notices should be handed in so as to take effect not later than September 25. Hopes are entertained that in the interval successful efforts may be made towards a settlement.

Miners' Wages and Output

THE following figures have been issued respecting the miners' wages and output for the years 1913 and 1920 :—

Number of workers :—

1913	1,110,000
1920	1,206,000
Increase	96,000

Output :—

1913	287,500,000 tons
1920 (estimated)	240,500,000 ,,
Decrease	47,000,000 tons

AVERAGE ANNUAL EARNINGS.
(all classes of mine-workers, including boys) :—

1913	£82
1920	£220

AVERAGE PAY PER SHIFT.
(adult male colliery workers) :—

1914 (8-hour day)	7/1
1920 (7-hour day)	18/3

The latter figure is exclusive of district and local increases.

The average controlled pit-head price of coal sold for home use is 33s. 6d. per ton. Of this sum 24s. 3d. is paid in wages to the miners.

Miners are supplied with free or cheap coal for their own consumption to the value of £8,000,000 a year.

Strike Effect on Chemical Industry

"Fifty thousand men in the chemical industry of this country will necessarily be given notice the day the coal strike becomes operative," declared Mr. Max Muspratt, chairman of the United Alkali Company, Ltd., at Liverpool, states the Coal Association. "Ten thousand of our men will have to receive notice," he continued. "The heavy chemical industry is an enormous consumer of fuel, to such an extent that it is impossible to hold reserve stocks. The United Alkali Company will have to close down within two or three days of the declaration of the coal strike."

French Chemical Market

ALTHOUGH this market remains steady, the tendency is towards a rise in prices, resulting from the insufficiency of the production as compared with the heavy demand. The increase in the price of coal, the higher rates of transport and the new taxes voted are not calculated to improve the cost price, and consequently the selling price. The higher cost of living that will inevitably result will react on the price of labour, which so far had apparently reached a maximum. There is a great dearth of chemical apparatus and of different containers for chemical products, among which may be mentioned carboys and their hampers, wooden casks, gas cylinders, enamelled pans, autoclaves, filter presses, porous cylinders, &c. Carbonate of soda is very scarce and has to be imported from America. This scarcity is due on the one hand to lack of coal, and on the other to the heavy increase in the demand. Formaldehyde is also in great demand, and is extensively used, together with phenol and cresol, for the production of artificial plastic material. On the whole it is reckoned that, on account of the factors mentioned above, certain chemical products will rise in price by 8 to 10 per cent. It is only the present very great scarcity of certain products that allows of their disposal at enormously high prices.—*J. Soc. Chem. Ind.*

Increase in Petrol Prices

On Monday it was announced that the following increases in the price of petrol, to take effect immediately, had been made :—

	Per gallon.
Best quality petrol	11d.
Second quality	7d.
For aviation	8d.
Kerosine...	1d.

This brings the retail price of petrol up to 4s. 1d. and 4s. 7d.

From Week to Week

Restrictions on the IMPORT OF OILS, FATS AND SOAP have been abolished in Germany.

SIR EDWARD THORPE has been elected president of the British Association for the forthcoming year.

DR. ROUX, the eminent French scientist, has been promoted to the Grand Cross of the Legion of Honour.

EXPORTS OF NITRATE OF SODA from Chile during the first two weeks of August amounted to 107,240 tons.

MR. R. S. GLENNIE, of the Battersea Polytechnic, has been appointed chief lecturer in pharmaceutics at the Royal Technical College, Glasgow.

DR. R. M. CAVEN, Principal of the Darlington Technical College, has been appointed Professor of Chemistry at the Glasgow University, at a beginning salary of £800 per annum.

The death is announced of MR. CHARLES C. MOORE, of Reddish House, Lymm, near Warrington, chemical manufacturer, and a member of the Society of Chemical Industry since 1887.

As a result of a barrel of CHLORATE OF POTASH exploding on Saturday, August 28, on a barge in Genoa harbour, a fire broke out, which quickly spread, and twenty other barges laden with goods were destroyed.

THE BRITISH ASSOCIATION OF CHEMISTS is now registered under the Trade Union Acts. The Association points out that this in no way implies the adoption of "militant labour union" methods in order to carry out its objects.

BENN BROTHERS JOURNALS, books and other publications will be on view at Stand No. 57 at the Birmingham and Midlands Business Efficiency Exhibition, to be held at Bingley Hall, Birmingham, on September 9 to 18 inclusive.

The rumour that EVANS, SONS, LESCHER & WEBB, chemical manufacturers, of Liverpool and London, were likely to be absorbed by the United Drug Company of America with which Boot's Pure Drug Co. recently amalgamated, is officially denied.

Trade unions in the dyeing and finishing departments of the textile trade decided at Bradford on Saturday to make an APPLICATION FOR AN ADVANCE of 40 per cent. on the current wages as from October 13. About 100,000 operatives are affected in Yorkshire, Lancashire, Cheshire, Derbyshire, and Scotland.

The *Palestine Weekly* suggests that the Holy Land may become a valuable new source of supply for the paper industry. Papyrus grass grows luxuriantly in the country, and there are vast quantities of peat in the swampy districts of Northern Palestine. The possibility of producing paper from peat pulp has recently been demonstrated by experiments at Manchester.

The French Ministry of Public Works has just issued a decree declaring that the establishment of a PIPE-LINE FOR CONVEYING LIQUID FUEL from Havre to Paris is a work of public utility. The pipe-line will pass through Bolbec, Yvetot, Barentin, Rouen and Pontoise, and it is reckoned that it will convey 2,400 tons of liquid fuel daily; the storage tanks will have a minimum capacity of 60,000 tons.

In a special report issued by the FUEL RESEARCH BOARD (Stationery Office, 4s.) an account is given of the researches carried out by Dr. Margaret W. Fishenden for the Manchester Corporation Air Pollution Advisory Board, with the assistance of grants from the Department of Scientific and Industrial Research, the results of which indicated that the open fire is not so wasteful and inefficient as it is sometimes represented.

A licence under the Companies (Consolidation) Act, 1908, has been issued by the Board of Trade to the BRITISH LEATHER MANUFACTURERS' RESEARCH ASSOCIATION, which has been approved by the Department of Scientific and Industrial Research as complying with the conditions laid down in the Government scheme for the encouragement of industrial research. The secretary of this association is Miss M. A. Stevens, 26, St. Thomas's Street, S.E. 1.

The death took place last week at his residence, Osborne Villa, St. Catherine's, of MR. J. H. BOWER, in his 66th year. Mr. Bower was a partner in the firm of Battle, Maltby & Bower, Victoria Chemical Works, Lincoln. A chemist by profession, he was formerly in the employ of Morris, Little & Co., artificial manure manufacturers, East Stockwith. About 30 years ago he went to Lincoln, and entered into partnership with Battle & Maltby in the manufacture of sheep dips, cattle medicines, &c.

The REPORT OF SIR JAMES J. DOBBIE, the Government chemist, on the work of the Government Laboratories for the year ended March, 1920, has been issued. It gives in detail the chemical work of the laboratories associated with 23 Government Departments and many public bodies. The total number of samples examined in the course of the year was 368,898, as compared with 289,180 in the preceding year; while the number examined at the Central Laboratory alone amounted to 199,388, against 184,392.

On Monday, September 20, the second annual swimming gala of the Boys' Welfare Department of the BRADFORD DYERS' ASSOCIATION will take place at the Corporation Baths. The programme includes the final stages of the George Douglas swimming cup competition, contests in connection with which have already been held in various baths in Lancashire and Yorkshire. The successful team in each of the Bradford, Manchester, and Halifax areas, together with the boys' team from Paisley, will compete in the semi-final. Other events comprise workshop squadron race, boys' championship race, water-polo match between teams representing the B.D.A. and the Bradford & District Amateur Swimming Association, and exhibitions of swimming by experts.

The EMPIRE MOTOR FUELS COMMITTEE fear that great damage may be done to the prospect of early production and marketing of new motor fuels if disregard is shown by the Patent Office for the known miscibility within various limits of alcohol, benzol, petrol and other hydro-carbons and carbohydrates, and the Committee warn the investing public that any claim to a master patent should be viewed with the maximum of doubt. The Committee feels it is regrettable in the public interests that the Patent Office should be allowing patents to be granted for mixtures which every chemist knows can be employed as fuels, and which every engineer knows are more or less applicable in existing engines or in engines slightly adapted in order to suit such mixtures.

MR. J. H. Macaulay, secretary of LOW TEMPERATURE CARBONISATION, LTD., in a letter to the *Financial News*, states that within the next few weeks the first section of a large plant for the low-temperature carbonisation of coal will be in full operation near Barnsley, Yorkshire. This plant will eventually be producing about 40,000 gallons per day of heavy fuel oil and motor spirit, in addition to large quantities of smokeless fuel, gas fuel, and fertilisers. The company have also recently completed contracts with the city of Sheffield and steel-makers around that city, which will necessitate erecting further large plants at an early date on even a larger scale than that above referred to. Negotiations are also proceeding with some of the leading towns in the country for the erection of more plants. There is no question whatever, Mr. Macaulay states, that the development of low-temperature carbonisation of coal is a question which Parliament will soon have to deal with, and make it compulsory to carbonise all bituminous or smoke-producing coal by low-temperature carbonisation.

The prospectus of FINE CHEMICALS, LTD., which appeared in the *Irish Times* last week, indicates the rapid advance which is being made in the development of an extremely important and valuable Irish industry. Founded less than twelve months ago to acquire the business previously carried on by the Apothecaries' Hall of Ireland, and to develop the manufacture of chemicals, drugs, &c., required for Irish consumption, the company has a remarkable record of success to show for so short a period of existence. In the period from December to May the sales had increased by more than 100 per cent., and the expansion has since been so great that the company finds itself obliged to issue the whole of the balance of the authorised capital in order to cope with the demand for its products. One of the aims of Fine Chemicals, Ltd., from the beginning has been to establish on a permanent basis the manufacture of the numerous necessary articles which are sold under this heading, and the premises are equipped with the most up-to-date plant, which serves for the production of over 400 different chemical products.

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GREASES. The consistency of greases. F. S. Cludlow and C. W. Taylor. *J. Soc. Chem. Ind.*, Aug. 31, pp. 291-295.

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RUBBER. Some aspects of the rubber stress-strain curve. W. B. Wiegand. *I. R. Journ.*, pp. 19-25, August 25. This is the conclusion of an article on the properties of the rubber Stress-Strain Curve, which has appeared in previous issues.

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A Shipowners' Directory

THE 1920 edition of "The Directory of Shipowners, Shipbuilders and Marine Engineers," which has just been issued, gives particulars of the leading steamship companies, shipbuilders, ship repairers and marine engineering works throughout the world. The names and addresses of the companies are given, and lists of fleets, together with such information as principal officials, passenger accommodation, speeds, carrying capacities and so on, are presented in such a way as to be readily referred to. The names of more than 8,000 officials and 7,000 vessels are referred to in the indices. The volume is of a handy size, which makes it a useful desk companion, and with its help the busy man may find the right firm, the right official and the right ship at the right moment. The Directory, which is priced at 20s. net, is published under the direction of the editor of the *Shipbuilding and Shipping Record*, by the Directory Publishing Co., Ltd., Queen Anne's Chambers, Westminster, S.W.1.

Patent Literature

Abstracts of Complete Specifications

123,739. FURNACE RETORTS. C. H. Smith, Shorthills, N.J., U.S.A. International Convention date (U.S.A.), February 18, 1918.

A horizontal retort for distilling coal is of an inverted heart shape in cross-section. Each side of the retort section contains a longitudinal conveyor shaft carrying agitating and conveying blades, and the paths of the two sets of blades intersect one another, so that each set of blades removes the material adhering to the other set of blades. Each conveyor shaft is built up of a number of tubular sections, which are secured together by providing each blade with a shank member, which passes through the projecting portion of one section and the socket portion of the adjacent section. The bearings of each conveyor shaft are carried in a removable head large enough to permit the withdrawal of the conveyor. The retort is heated by a series of longitudinal flues surrounding it, separated from one another by radial ribs and constructed of hollow tiles of carborundum or a mixture containing carborundum. The flues are surrounded by a heat-storing layer of material, such as fire-brick, and this layer is surrounded by heat-insulating material, such as sigur brick. This is surrounded by a layer of asbestos, and the whole is contained in a metal casing. The construction and method of working are described in detail.

125,083. PEAT FUEL, PROCESS FOR MANUFACTURING. H. P. K. T. Neilsen, 46, Oster Sogade, Copenhagen, Denmark. International Convention date (Denmark), March 30, 1918.

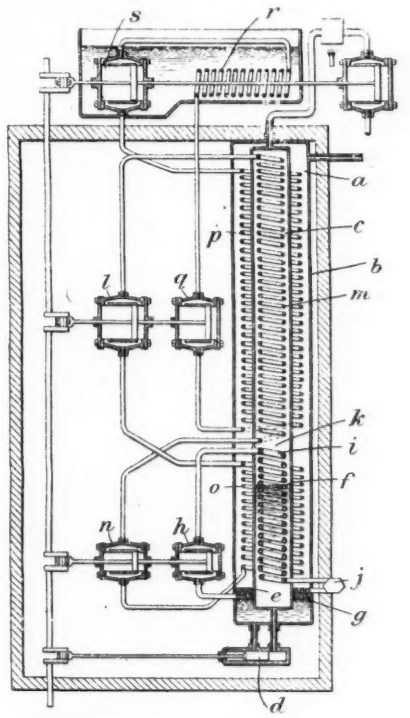
The object is to obtain a hard and practically dry fuel from raw peat without briquetting. The peat is ground in a ball mill or tube mill until comminuted, and water is then extracted; the peat is then dried during or after moulding into blocks. It is found that peat which contains 85 per cent. of water after grinding may have its water content reduced to 10 to 15 per cent. after a few days of air drying.

148,615. BASIC SULPHATE OF CHROME, PRODUCTION OF, AND ITS APPLICATION TO TANNING AND OTHER USES. J. Morel, 1, rue Molière, Grenoble (Isère), France. Application date, April 22, 1919.

An alkaline bichromate or neutral chromate in solution or in contact with water is treated with sulphur dioxide which may be obtained by the combustion of sulphur, sulphur ore, or by the roasting of pyrites in an air current; no sulphuric acid is added. The resulting solution contains sodium sulphate and basic chromium sulphate, $Cr_2(SO_4)_2(OH)_2$, the former of which may be removed by cooling and crystallising. The remaining solution may be used for tanning or in other operations, such as dyeing, printing, &c., in which salts of chromium, alums, chlorides, &c., are employed.

148,588. COOLING AND LIQUEFACTION OF GASEOUS FLUIDS, PROCESS AND APPARATUS FOR. O. Imray, London. (From E. A. W. Jefferies, 46, Elm Street, and F. E. Norton, 656, Main Street, both in Worcester, Mass., U.S.A.) Application date, January 30, 1919.

The apparatus is for carrying out processes of refrigeration and liquefaction at very low temperatures, and the object is to avoid the step of preliminary compression usually employed. The gas is led at about atmospheric pressure into the upper end *a* of a heat interchanger, *b*, and is liquefied as described below while passing downward to the pump *d*, which delivers it to the bottom of the cylinder *c* at a considerably higher pressure. The high pressure liquid in the cylinder *c* is evaporated, and the vapour passes upwards in counter-current, so as to extract heat from the incoming gas in the space *b*. This evaporation is effected by transferring the latent heat of condensation at the liquid surface *e* to evaporate the warmer liquid at the surface *f*. To accomplish this, a gas, which may be the working gas, is circulated by a compressor *h* at a slightly higher pressure than the pump *d* from a coil *g* in the liquid at *e* to the warmer end *i* of a coil immersed in the liquid in the cylinder *c*. The lower and colder end of the coil *i* communicates with an expanding nozzle, *j*, and thence back to the coil *g*. If the pressure in this closed system is slightly higher and the amount circulated is slightly greater than that of the working fluid, then the transfer of heat mentioned above will take place. Since the transfer of heat takes place under a very slight temperature difference the efficiency is very high. The high-pressure gas evaporated at the surface *f* has a higher specific heat than the incoming gas at *a*, and the excess cooling effect available may be used to remove any superheat in the circulating gas in the coil *i*, so that the liquid in the cylinder *c* boils off at a level somewhat below *k*. The excess of cooling effect in the high pressure gas above *k* is used to supply the deficiency of cooling effect in the cold end of the low-pressure space *a* as follows: A fluid, which may be the working fluid, is forced by the compressor *l*, working at the same



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pressure as the pump *d*, through the coil *m*, where it is progressively cooled to the temperature at the point *k*, and then passes through an expansion engine, *n*, where it is cooled to the temperature at the point *e*. The gas then passes upwards through the coil *o* in counter-current to the gas in the space *a*, which it cools progressively to liquefying point, and then passes back to the compressor *l*. The temperature difference is again only very slight. The only external cooling agency used is that necessary to cool the vapour in the space *a* from atmospheric temperature to the temperature at the point *k*, the drop being comparatively small. This cooling may be effected by a coil *p*, expander *q*, water cooler *r* and compressor *s*.

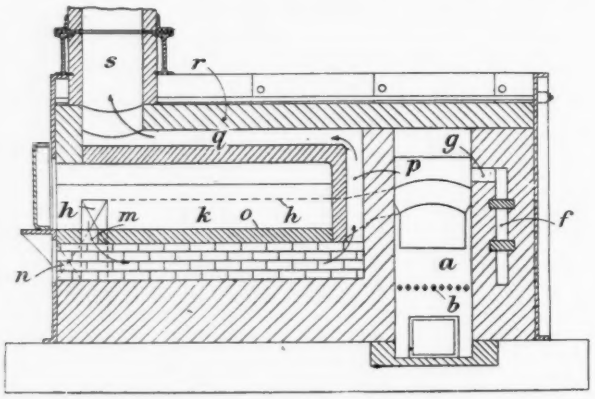
148,617. MANUFACTURE OF DYES. R. Maclaurin, Homesteads, Cambusbarron, Stirling. Application date, April 24, 1919.

The object is to produce dyes from the ammonia liquor and the liquors obtained by washing with water the oils obtained by carbonisation or gasification of bituminous fuels at low temperature. The liquor is first treated with sufficient acid to neutralise free ammonia and decompose sulphides, and is then filtered to separate tarry matter. The liquor is then nearly neutralised and ferrous sulphate is added, which gives

a slate-coloured precipitate. This precipitate, shaken with water in a slightly alkaline bath, dyes wool a slate colour becomes brown by after-chroming. The liquor, after removing the above precipitate, is acidified and sodium nitrite added, giving a precipitate which is filtered off, and the liquor is then nearly neutralised and ferrous sulphate is added, which precipitates a green dye. The treatment with sodium nitrite may precede the extraction of the slate-coloured precipitate.

148,630. MUFFLE AND SEMI-MUFFLE AND LIKE FURNACES. C. F. Priest, Dudley House, Coatham, Redcar, Yorks. Application date, April 26, 1919.

Two combustion chambers, *a*, are separated by a longitudinal partition extending upwards about half their height, and are provided with fire bars, *b*. Part of the air for combustion enters through passages, *f*, and openings, *g*, into the upper part of the combustion chambers, and the hot gases pass through longitudinal passages, *h*, in the side walls of the furnace chamber *k* to the front end of the furnace. The hot gas passes across the front of the furnace chamber, but not through it,



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and downward through openings, *m*, into a number of longitudinal passages, *n*, below the floor *o*. The passages *n* open into a vertical flue, *p*, and the gas then passes through a passage, *q*, in the roof *r* to the chimney *s*. A modification is described in which the hot gas, after passing through the flues *h* is divided into two parts, one passing back through the chamber *k*, and the other downward through the openings *m*. In both constructions the combustion chambers *a* are not in immediate contact with the floor *o* and the life of the latter is thereby prolonged.

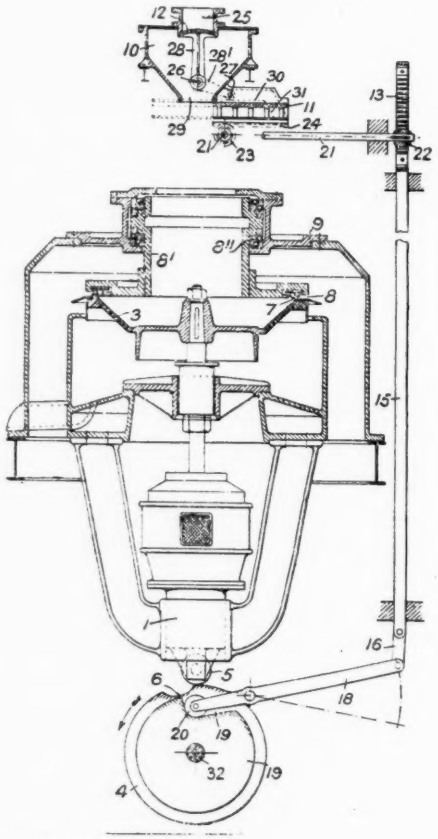
148,637. GRINDING OR DISINTEGRATING ORES OR OTHER MATERIALS, METHOD OF. H. W. Hardinge, 120, Broadway, New York. Application date, April 29, 1919.

A rotating conical tube mill is mounted on hollow horizontal trunnions, through which the material is supplied and discharged. The inlet end of the mill is a cone of wide angle, and the outlet end is a cone of much smaller angle. A large number of freely-moving grinding media of varying sizes are arranged in the mill, and these arrange themselves with their smaller sizes towards the outlet opening. The wall of the mill is perforated, and is provided with a perforated, replaceable, internal lining, so that the material is discharged through the perforations as soon as it is ground to the required degree of fineness. The perforations in the lining may register with the perforations in the wall, or may cover several wall perforations.

International Specifications Not yet Accepted

145,397. CENTRIFUGAL MACHINES. C. A. Fesca & Sohn, 127, Herzbergstrasse, Lichtenberg, Berlin. (Assignees of L. von May, Moravia, Ung. Austria.) Internation convention date, June 18, 1919.

Material is fed into a centrifugal separator from a hopper, 10, through an opening, 8′, to a rotating basket, 3. The basket is provided with a rim, 7, which engages with and drives the annular member 8 and ring 8′ when the basket is raised to its uppermost position. The ring 8′ is mounted on ball bearings, 8″. The basket is thus closed at the top and is in operating position. The lower end of the vertical shaft of the separator carries a roller, 5, resting on a cam, 4, carried by a shaft, 32, so that when the roller drops into the recess 6 the basket 3 is lowered to discharge the material. The hopper 10 is provided with an inlet, 25, closed by a slide, 12, and an outlet, 29, closed by a slide, 11, the two slides being operated alternately. The slide 11 carries a rack, 24, engaging with a



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pinion, 23, which is operated by shaft, 21, carrying a pinion, 22 The pinion 22 is operated by a rack, 13, carried by a rod, 15, which is operated periodically by means of the cam 19 acting on the roller 20. The slide 11 is provided with a groove, 30, having a downward extension, 31, so that at the end of its travel the slide 12 is operated by means of the lever 28, 28′ carrying a roller, 27, sliding in the groove 30, 31.

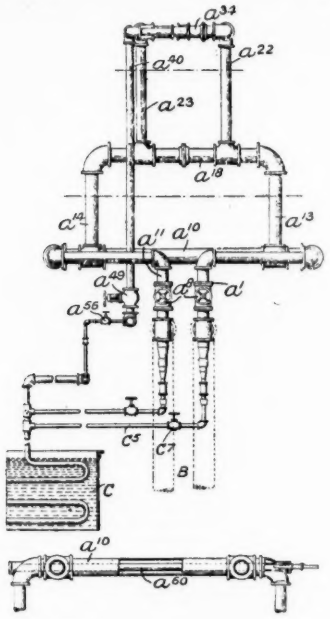
145,408. GAS PRODUCERS. G. A. Pestalozzi, Kusnacht, near Zurich, Switzerland. International Convention date, June 20, 1919.

Water, steam or gases are injected horizontally into a producer to maintain a zone in the upper part of or above the fuel at a temperature below 400°C. The resulting tar contains compounds of the aliphatic series.

145,407. REFLUX CONDENSERS. L. P. Litzinger and P. F. Conerty, Butler, Pa., U.S.A., and W. Snodgrass, Bruin, Pa., U.S.A. International Convention date, June 19, 1919.

The condenser is air cooled, and is suitable for distilling oils under normal or high pressure. Vapour from the still passes by two pipes *B* and pipes *a′*, *a″* to the two ends of a horizontal air-cooled pipe, a^{10}, which may be cooled in addition by spraying cold liquid on it or by providing an inner pipe, a^{60}, for the cooling liquid. The uncondensed vapour then passes through pipes a^{13}, a^{11} to a similar horizontal pipe, a^{18}, and finally by pipes a^{22}, a^{23} to a horizontal pipe, a^{34}. All

the horizontal pipes act as expansion chambers for the vapour. The uncondensed vapour still remaining then passes downwards through a pipe, a^{40}, having a pressure-regulating valve,



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a^{56}, to a condenser, C. The reflux condenser may be cut out and the vapour led directly to the condenser C by closing valves a^8, a^{49}, and opening valve C^7 in by-pass pipe C^5.

145,415. RESINS, SYNTHETIC. G. S. Walpole, 121, Victoria Street, Westminster. (Assignees of F. H. Meyer, Hainholz, Hanover, Germany.) International Convention date, February 1, 1916.

Solvent naphtha is treated with sulphuric acid and the solution neutralised by agitating it by means of air with dry powdered alkali carbonate or alkaline earth carbonate with or without alkali or alkaline earth peroxides. The solution is allowed to stand, filtered or centrifuged to separate solid matter, and volatile hydro-carbons are then distilled off.

145,430. CELLULOID. Folien and Flitterfabrik Akt.-Ges., Hanau-on-Main Germany. International Convention, date, September, 13, 1917.

Celluloid is coated with gelatine by dipping, spraying or painting, and the gelatine hardened by formaldehyde or alum. The celluloid is thereby rendered less inflammable.

LATEST NOTIFICATIONS.

149,911. Desulphurizing Gases. Farbwerke vorm. Meister, Lucius, & Bruning. July 29, 1919.

149,667. Acid chambers, acid towers, acid mains, and similar arrangements. Pfannenschmidt, P.L. July 31, 1919.

149,670. Anhydrous magnesium-chloride. Bull, H. J. August 6, 1919.

149,688. Neutral alkyl esters of sulphuric acid. Kuh, E. August 8, 1919.

149,691. Recovery of volatile liquids from their mixtures with air. Barbet et Fils et Cie, E. August 1, 1919.

149,915. Apparatus for chemical production and research. Brutzkus, M. August 4, 1919.

Specifications Accepted, with Date of Application

132,488. Water-gas, Process and apparatus for producing, and for carbonising coal. H. L. Doherty. September 7, 1918.

134,197. Alkaloids, Process for isolation of. Chemische Fabrik vorm. Sandoz. October 25, 1918. (Addition to 125,396.)

139,462. Nitrogeneous fertilisers. Norsk Hydro-Elektrisk Kvaelstofaktieselskab. February 24, 1919.

149,355. Acetone and butyl alcohols, Fermentation processes for the production of. C. Weizmann. February 24, 1916.

149,366. Arsenious ores, Treatment of. H. J. Wilson. January 3, 1919.

149,374. Starch and conversion products thereof, Method of manufacturing, and the products obtained therefrom. A. W. H. Lenders. March 5, 1919.

149,398. Liquid fuel, Process of producing, and product thereof. E. C. R. Marks. (U.S. Industrial Alcohol Co.) May 7, 1919.

149,428. Dyestuffs containing the sulphonamide group, Application of, to dyeing and printing. J. W. McMyn. May 13, 1919.

149,453. Aluminous materials, Conversion of powdered, into granular form. J. J. Hood. May 20, 1919.

149,477. Moulds for casting chemical and other sticks. T. Tucker. May 31, 1919.

149,553. Azo-dyestuffs and intermediate products therefor, Manufacture of. O. Imray. (Society of Chemical Industry. May 12, 1919.

Applications for Patents

Atherton, H. Carbon di-oxide recorders. 24,495. August 24.

Bearder, E. A. Manufacture of cellulose-acetate filaments. 24,594. August 25.

Blicquy, J. de & Callebaut, C. Dye vats, &c. 24,823. August 27.

Brandwood, J. Dyeing, bleaching, &c. textile fibres, &c. 24,423. August 23.

,, T. Dyeing, bleaching, &c. textile fibres, &c. 24,423. August 23.

Carey, R. F. Liquid-pressure intensifier. 24,455. August 23.

Denington, R. C. Process of converting cellulosic and ligneous material into sugars. 24,746. August 26.

Elektro-Osmose Akt.-Ges. (Graf Schwerin Ges.). Purifying, dehydrating, or concentrating aqueous solutions of colloids, &c. 24,945. August 28. (Germany, September 11, 1919.)

Holden, F. & Pandrich, H. S. Utilization of nitre cake and waste liquor from the ammonia-soda process. 24,937. August 28.

Macfarlane, T. D. Apparatus for production of ozone. 24,529. August 24.

Molassine Co. (Whalley, H. C. S. de). Artificial manure or fertilizer. 24,933. August 28.

Noef, E. E. Recovery of sulphur from sulphuretted hydrogen and ammonium sulphide and gases containing such. 24,387. August 23.

Norske Aktieselskab for Elektrokemisk Industri Norsk Industri-Hypotekbank. Process for production of alumina from aluminium nitrate solutions. 24,847. August 27. (Norway, September 19, 1919.)

O'Dell, A. E. (Canadian-American Finance & Trading Co.). Hydrogenating bituminous substances. 24,480. August 23.

,, Distillation process. 24,481. August 23.

,, Mechanism for diffusing gases and vapours through liquids. 24,482. August 23.

Parr, C. E. Process for desulphurizing carbonaceous material. 24,432. August 23.

Pearson, R. Process for desulphurizing carbonaceous material. 24,432. August 23.

Perkins, W. G. Treatment of complex sulphide ores. 24,924. August 28.

Perry, W. P. Process of converting cellulosic and ligneous material into sugars. 24,746. August 26.

Soc. Anon. d'Applications des Gaz Liquéfiés. Device for closing receptacles for compressed or liquefied gases. 24,695. August 25. (France, September 6, 1919.)

Spink, J. R. Apparatus for production of ozone. 24,529. August 24.

Tyrer, D. Extraction of alumina. 24,579. August 24.

The Vapour Pressure of Lead Chloride

DURING the past few years interest has been revived in the possibility of treating certain complex ores, especially those of lead, zinc, silver, and copper by a process involving a chloridising roast, and subsequent volatilisation of part or all of the valuable metallic constituents. To make special study of this process it is necessary to know the vapour pressures of the chlorides of the metals involved. Therefore the vapour pressure of lead chloride was investigated by the Bureau of Mines, U.S.A.

In principle, the method used by the Bureau is the familiar one of determining the weight of the substance under investigation that is required to saturate a measured amount of inert gas at known and constant temperatures and pressures.

The details of application of the method and experimental results for lead chloride at temperatures between 500° C. and 850° C. are given in the official report issued by the Bureau, and appear to be :—M.P. of Lead Chloride = 495°C. and B.P. = 945°C. at a pressure of 754 mm. of mercury. An average M.P. of 498°C. was adopted as the best average of all determinations, and the heat of vaporisation at the M.P. is calculated to be 40,600 calories.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, September 2, 1920.

There has been during the past week a continuance of the quiet conditions which we have reported during August, but, as we write, there is perhaps a slightly better tendency and inquiry is more sustained.

The immediate future, of course, depends very largely upon the possibility of labour troubles, and until that question is settled we cannot look for any remarkable access of confidence.

The export trade remains quiet with no feature of outstanding interest.

General Chemicals

ACETONE remains in steady demand at recent values.

ACETIC ACID this week has witnessed more improvement in demand, and the stocks in this country have been materially reduced. The tendency is decidedly firmer.

ACID, CARBOLIC, shows no improvement, and favours buyers.

ACID, CITRIC, is steady, and appears to have found its level. There is a growing reluctance on the part of second hands to continue selling at a loss.

ACID, FORMIC, is unchanged in price, and in quietly steady inquiry.

ACID, LACTIC, is uninteresting, and little business passing.

ACID, OXALIC, is unchanged in price but the demand is slow.

ARSENIC remains scarce and firm for early delivery.

BARIUM SALTS are unchanged, and experience little support.

COPPER SULPHATE.—The market shows no improvement, but there is no change in the nominal quotation.

FORMALDEHYDE is now in better inquiry, and as stocks become more limited an improvement in value is not unlikely.

LEAD SALTS are drooping owing to the absence of demand.

POTASSIUM BICHROMATE is quietly easy at recent rates.

POTASSIUM PERMANGANATE is in rather better supply, but the price is maintained.

SODIUM SALTS.—It is reported that the English makers are advancing the price of all soda compounds to compensate for the increase in railway charges and decreased production. Full particulars will be given in our next issue.

SODIUM ACETATE has been more called for, and is rather firmer.

SODIUM BICHROMATE.—There has been lower second-hand offers during the current week, but the total quantity available only seems to be small, and any revival in the export demand will quickly reveal firm undertone.

SODIUM CAUSTIC is inclined to be easier on foreign offering.

SODIUM HYPOSULPHITE is scarce and dear for early delivery.

SODIUM NITRITE is firm in price, and stocks are limited.

SODIUM SULPHIDE is inclined to be easier owing to the absence of export support.

ZINC SALTS.—Unchanged.

Coal Tar Intermediates

There is little change to report in this market since our last issue, and values remain very steady, and with an upward tendency in one or two cases.

ALPHA NAPHTHYLAMINE has been inquired for on export account, but little business has been transacted. The market remains steady.

ALPHA NAPHTHOL is again in request, and some business has been done for forward positions.

BETANAPHTHOL continues extremely scarce and firm.

DINITROPHENOL is active, and the price has an upward tendency.

DIPHENYLAMINE has been rather quiet.

DIMETHYLANILINE is practically unobtainable for near delivery, and there does not seem to be much possibility of the position being altered with the present shortage of Methyl Alcohol.

PARANITRANILINE is in steady request, and makers are very firm in their ideas of price.

Coal Tar Products

There is practically no change to report since last week.

90's BENZOL is quoted at 3s. 4d. on rails in the North, and 3s. 6d. to 3s. 7d. in the South.

PURE BENZOL is still worth from 3s. 6d. to 3s. 9d. per gallon on rails.

CREOSOTE OIL remains firm at 1s. to 1s. 1d. in the North, and 1s. 1d. to 1s. 2d. in the South.

CRESYLIC ACID is still rather slow and prices remain at 4s. to 4s. 2d. per gallon for the Dark 95/97 per cent. quality. Pale, 97/99 per cent. qaulity is rather firmer at 4s. 7d. to 4s. 10d. per gallon.

SOLVENT NAPHTHA 90/160 is still quoted at 3s. 3d. per gallon on rails.

HEAVY NAPHTHA 90/190 is worth about 3s. 6d. still per gallon on rails.

NAPHTHALENE.—The demand remains firm, and the prices are unchanged.

PITCH.—The position remains unchanged. Business is quiet at the moment, but prices are still maintained.

Sulphate of Ammonia

The demand for Home Trade is quiet, but Export business remains satisfactory.

Current Prices

Chemicals

	per	£	s	d.		£	s.	d.
Acetic anhydride	lb.	0	3	9	to	0	4	0
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	120	0	0	to	125	0	0
Acid, Acetic, glacial, 99-100%	ton	105	0	0	to	110	0	0
Acetic, 80% pure	ton	87	10	0	to	90	0	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst.	ton	74	10	0	to	76	0	0
Carbolic, cryst. 39-40%	lb.	0	1	0½	to	0	1	1
Citric	lb.	0	4	9	to	0	5	0
Fluoric	lb.	0	0	7½	to	0	0	8
Formic, 80%	ton	115	0	0	to	120	0	0
Gallic, pure	lb.		7	6	to	0	7	9
Hydrofluoric	lb.	0	0	7½	to	0	0	8
Lactic, 50 vol.	ton	58	0	0	to	60	0	0
Lactic, 60 vol.	ton	72	10	0	to	75	0	0
Nitric, 80 Tw.	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	2	5	to	0	2	6
Phosphoric, 1.5	ton	65	0	0	to	67	0	0
Pyrogallic, cryst	lb.	0	11	6	to	0	11	9
Salicylic, Technical	lb.	0	2	6	to	0	2	8
Salicylic, B.P.	lb.	0	3	2	to	0	3	3
Sulphuric, 92-93%	ton	8	10	0	to	8	15	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	3	3	to	0	3	4
Alum, lump	ton	19	10	0	to	20	0	0
Alum, chrome	ton	92	0	0	to	93	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	17	10	0	to	18	10	0
Aluminium, sulphate, 17-18%	ton	20	10	0	to	21	10	0
Ammonia, anhydrous	lb.	0	2	2	to	0	2	4
Ammonia, .880	ton	45	0	0	to	50	0	0
Ammonia, .920	ton	32	10	0	to	37	10	0
Ammonia, carbonate	lb.	0	0	7½	to		—	
Ammonia, chloride	ton	100	0	0	to	105	0	0
Ammonia, muriate (galvanisers)	ton	60	0	0	to	65	0	0
Ammonia, nitrate	ton	65	0	0	to	70	0	0
Ammonia, phosphate	ton	125	0	0	to	130	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	3
Amyl acetate	ton	420	0	0	to	425	0	0

	per	£	s.	d.		£	s.	d.
Arsenic, white, powdered	ton	74	0	0	to	76	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	32	0	0	to	33	0	0
Nitrate	ton	55	0	0	to	56	0	0
Barium Sulphate, blanc fixe, dry	ton	28	10	0	to	30	0	0
Sulphate, blanc fixe, pulp	ton	16	10	0	to	17	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	8
Bleaching powder, 35-37%	ton	26	0	0	to	28	0	0
Borax crystals	ton	41	0	0	to	42	10	0
Calcium acetate, Brown	ton	20	0	0	to	21	0	0
,, Grey	ton	35	0	0	to	37	10	0
Calcium Carbide	ton	30	0	0	to	32	0	0
Chloride	ton	9	10	0	to	10	10	0
Carbon bisulphide	ton	65	0	0	to	67	0	0
Casein, technical	ton	75	0	0	to	80	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	8	6	to	0	9	0
Oxide, black	lb.	0	10	0	to	0	10	3
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	41	0	0	to	42	0	0
Cream Tartar, 98-100%	ton	275	0	0	to	280	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	325	0	0	to	330	0	0
Formusol (Rongalite)	lb.	0	5	0	to	0	5	6
Glauber salts	ton	Nominal.						
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	85	0	0	to	87	10	0
Carbonate (White Lead)	ton	65	0	0	to	67	10	0
Nitrate	ton	55	0	0	to	57	0	0
Litharge	ton	59	0	0	to	61	0	0
Lithopone, 30%	ton	50	0	0	to	51	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	13	10	0	to	14	0	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate	ton	190	0	0	to	—		
Sulphate	ton	100	0	0	to	105	0	0
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	gall.	Nominal.						
Nickel sulphate, single salt	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potassium bichromate	lb.	0	2	1	to	0	2	2
Potassium Carbonate, 90%	ton	115	0	0	to	120	0	0
Chloride	ton	50	0	0	to	52	0	0
Chlorate	lb.	0	0	9½	to	0	0	10½
Meta-bisulphite, 50-52%	ton	260	0	0	to	270	0	0
Nitrate, refined	ton	65	0	0	to	67	0	0
Permanganate	lb.	0	4	0	to	0	4	3
Prussiate, red	lb.	0	4	9	to	0	5	0
Prussiate, yellow	lb.	0	2	0	to	0	2	1
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	5	10	0	to	—		
Seconds	cwt.	5	5	0	to	—		
Sodium acetate	ton	59	0	0	to	61	0	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	1	7	to	0	1	8
Bisulphite, 60-62%	ton	50	0	0	to	52	10	0
Chlorate	lb.	0	0	5½	to	—		
Caustic, 70%	ton	36	10	0	to	38	0	0
Caustic, 76%	ton	39	10	0	to	41	0	0
Hydrosulphite, powder, 85%	lb.	0	4	0	to	0	4	6
Hyposulphite, commercial	ton	35	10	0	to	37	10	0
Nitrite, 96-98%	ton	87	10	0	to	90	0	0
Phosphate, crystal	ton	44	0	0	to	46	0	0
Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	1	2½	to	0	1	3½
Sulphide, crystals	ton	30	0	0	to	32	0	0
Sulphide, solid, 60-62%	ton	62	10	0	to	64	0	0
Sulphite, cryst	ton	15	10	0	to	16	10	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Nitrate	ton	90	0	0	to	95	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	19	0	0	to	19	10	0
Roll	ton	19	0	0	to	19	10	0
Tartar emetic	lb.	0	3	2	to	0	3	4
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb	0	2	0	to	0	2	1
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	82	10	0	to	85	0	0
Oxide, 94-95%	ton	70	0	0	to	72	10	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	21	10	0	to	23	10	0

Coal Tar Intermediates, &c.

Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	5	6	to	0	5	9
Alphanaphthylamine	lb.	0	4	0	to	0	4	3
Aniline oil, drums extra	lb.	0	1	8	to	0	1	9
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.		—		to		—	
Benzaldehyde (free of chlorine)	lb.	0	5	9	to	0	6	0
Benzidine, base	lb.	0	13	6	to	0	14	0
Benzidine, sulphate	lb.	0	10	6	to	0	11	0
Benzoic acid	lb.	0	5	3	to	0	5	6
Benzoate of soda	lb.	0	5	3	to	0	5	6
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	5	6	to	0	5	9
Betanaphthylamine, technical	lb.	0	11	6	to	0	12	6
Croceine Acid, 100% basis	lb	0	5	0	to	0	6	3
Dichlorbenzol	lb.	0	0	6	to	0	0	7
Diethylaniline	lb.	0	7	9	to	0	8	6
Dinitrobenzol	lb.	0	1	4	to	0	1	5
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	2	9	to	0	3	0
Dimethylaniline	lb.	0	5	3	to	0	5	9
Diphenylamine	lb.	0	5	0	to	0	5	3
H-Acid	lb.	0	14	6	to	0	15	0
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	6	to	0	8	0
Naphthionic acid, crude	lb.	0	5	6	to	0	6	0
Naphthionate of Soda	lb.	0	6	0	to	0	6	3
Naphthylamin-di-sulphonic-acid	lb.	0	5	6	to	0	6	6
Nitronaphthaline	lb.	0	1	4	to	0	1	6
Nitrotoluol	lb.	0	1	3	to	0	1	4
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	6	to	0	2	9
Orthonitrotoluol	lb.	0	1	3	to	0	1	4
Para-amidophenol, base	lb.	0	15	0	to	0	16	0
Para-amidophenol, hydrochlor	lb	0	15	6	to	0	16	6
Paradichlorbenzol	lb.	0	0	6	to	0	0	8
Paranitraniline	lb.	0	8	6	to	0	9	0
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	6
Paratoluidine	lb.	0	8	6	to	0	9	6
Phthalic anhydride	lb.	0	4	9	to	0	5	0
R. Salt, 100% basis	lb.	0	4	0	to	0	4	2
Resorcin, technical	lb.	0	11	6	to	0	12	6
Resorcin, pure	lb.	1	2	6	to	1	5	0
Salol	lb.	0	6	9	to	0	7	0
Shaeffer acid, 100% basis	lb.	0	3	6	to	0	3	9
Sulphanilic acid, crude	lb.	0	1	6	to	0	1	7
Tolidine, base	lb.	0	10	6	to	0	11	6
Tolidine, mixture	lb.	0	3	0	to	0	3	6

Alsatian Potash

The increased demand for Alsatian potash by importers and manure merchants at this season is an indication that it is being offered at reasonable prices. As it is proving very satisfactory in the making of compound fertilisers, and is giving good results on all crops and soils, there is every reason for the confidence with which buyers are asking for it.

During the past week quotations were as follows: Sylvinite, 14 per cent. (French kainite), £7 13s. 6d.; sylvinite, 20 per cent. (French potash manure salts), £9 13s. 6d.; sylvinite, 30 per cent. (French potash manure salts), £13 13s. 6d.; muriate of potash, 50 per cent., £28 5s.

Answer to Inquiry—'920 Ammonia

LIQUID ammonia is an extremely difficult article to report on as regards price, owing to extreme variation in values. For instance, ammonia in the south of England is very considerably higher than in the north, and actually the London price to-day for '920 ammonia in carboys is over £37 10s. per ton. There are many fluctuations in this article in regard to purity, packages, delivery, &c.

Benn Brothers, Limited

Another Year of Progress

THE twenty-fourth annual general meeting of Benn Brothers, Ltd., was held at the offices of the company on Friday, August 27, Sir John Benn presiding.

The chairman, in moving the adoption of the report and accounts, congratulated the shareholders on the strong position of the company and the continued growth in the volume of its business.

Dealing with the record of the past year, Sir John said: "It is a remarkable tribute to the skill and energy of our most efficient staff to be able to report that our revenues from advertisements and subscriptions have risen during the year by some £70,000, an achievement which would in normal times have produced a very substantial addition to the shareholders' return. As it is, almost the whole of this large sum has been absorbed in increased expenditure, the greater part of it going directly to our friends the printers and paper makers.

Cost of Production

Personally, I do not complain of the increases which have taken place in the wages of printers' operatives. Having regard to the exceptional skill necessitated in the art and practice of printing, I still think that many members of that craft cannot be regarded as overpaid. Indeed, if the present level of wages for unskilled labour is to be regarded as permanent, there will, in my judgment, be a need for a further advance in the rates paid to several classes of our workers. But I do confess to a feeling of alarm at the growing disregard of the need of increased production. Speed is as essential to the Press as to the railways, and any failure to maintain a reputation for the highest rate of production attainable is a definite disservice to the community as a whole and a damaging blow to the industry upon which both printers and publishers so largely depend. For this reason I hope that our report and accounts may find their way into the hands of those whose advice guided the printers in the matter of possible wages. From these documents they will see that our organisation, which I venture to think is no exception among publishing enterprises, has for the past few years been carried on very largely for the benefit of the printers rather than the publishers. Since war began our printing charges have increased nearly two-and-a-half times, while payments to our shareholders have remained stationary.

If we are successful in still further building up our revenues, we hope to be able to do better both for our shareholders and for our workpeople, but on these figures it is surely the turn of the shareholders to claim that they may enjoy the next advance that may be possible. We are paying a dividend which is twice as large as the return obtainable from British Government stock, but it cannot be pretended that this is adequate, having regard to the risks associated with a business whose chief asset is that intangible thing known as "goodwill." Progress in the future will therefore largely depend upon our ability to offer a better return to those who are willing to risk their money with us, and on these very practical and material grounds I ask our printing friends to remember that we stand or fall together.

Neither do I complain of the prosperity which has been so apparent among our friends the master printers. Printing wages have leapt ahead, and so have printers' prices, and printers' profits have kept well up in the race. I think that master printers should now reconsider their position, with a view to seeing how far they can secure the profits they desire out of increased turnover rather than out of higher prices. There was a time when the printing trade was admittedly unremunerative, but the pendulum has now swung with unexpected force, in the other direction. The well-being of this country depends upon cheap printing, and there is a vast mass of new thought and information which is now, alas! denied to the public by reason of the prohibitive level of printing prices.

Paper

Then again, the question of paper has caused your directors no little anxiety. It has been, indeed, by far the greatest of the difficulties with which they have had to deal. Unlike printing, paper is an international problem, and there can be little hope of easement until the world generally settles down to work. We have, I think, seen the end of profiteering by outside speculators, but we are still faced with the unfortunate determination of many of the largest mill proprietors to take full advantage of the present shortage. Your directors are basing their calculations for the current year upon their belief that the present position cannot last and that there will surely be some measure of relief from the intolerable position of the moment.

The Intrinsic Strength of British Trade

Publishing as we do a dozen representative journals, touching every corner of British industry, our business constitutes a very reliable barometer of the state of trade generally.

If I were arguing in the abstract it would be easy to prove to you that the trade and industry of this nation did not in fact exist. There are happening to-day a score of things any of which in normal times would have been regarded as fatal to our commercial position. To begin with, we are engaged in I don't know how many big and little wars, a state of affairs which in the old world would have taken every bit of life out of the industries of peace. Next, we business men still have to give a large proportion of our time to satisfy the requirements of the eighty departments of the Government, and the two-and-a-half million imperial and local bureaucrats, whose main object in life seems to be to make business as difficult as possible. We seem to be living under a Government which is everything in turns and nothing long. Whether it stands for Free Trade or Protection nobody seems to know, and yet, a few years ago, we held that a definite policy in such vital matters was essential to the successful conduct of the nation's trade. I need not remind you of the burden of taxation, which means that half the results of the efforts of the average business man are taken from him.

Again, a glance at the labour situation, either from the point of view of output or of the policy of the advanced section of the Labour Party, might well cause grave doubts as to the possibility of carrying on any commercial undertaking successfully.

But, ladies and gentlemen, notwithstanding all these disquieting portents, I have to report to you that our business to-day is four times as large as it was before the war, and if our claim to be a barometer of trade as a whole is good, I think we may well take courage. In my view the fact that our industries have successfully withstood all these attacks, from all these quarters, and dealt with the many new and unprecedented demands that have been put upon them, shows an inherent soundness and an intrinsic strength of which we may be justly proud. As trade paper proprietors we can claim to have done our share in building up that great position, and if only we all continue, both labour and capital, employers and employed, to keep our heads and do our best, I for one have no fear of the future. We have no use for pessimists in our undertakings.

The Trade Press as a National Asset

My duty as chairman to-day has been to deal with our efforts from the personal or dividend point of view. Passing from what I may call the selfish side of my task, may I invite you to extend your purview to the place of the trade and technical press in our national welfare?

When the Great War came upon us it seemed, for a time, as if the trade paper was no longer wanted. The relentless hand of war closed our factories and scattered our craftsmen. Why advertise? Why trouble about trade? But far-seeing business men wisely kept their flags flying or their signboards swinging. They recognised that the only thing which could save the country after a devastating war was the well-equipped and up-to-date workshop—with increased production—and so the trade press became, in a sense, the arsenal of the munitions of peace. Little is heard among millions of consumers of those trade and technical papers. We do not happen to live on head lines or sensational articles, but we do provide a storehouse for the best brains and hands of the arts and crafts. In our pages the able scientist can get a hearing, and the clever designer or inventor, or the man with an idea, an early reward for his talents Such mundane things as business and workshop management, efficient accountancy and a thousand other topics, are discussed in our pages, and still our industrial public "ask for more." This is, I think, the best evidence of our claim to be classed as a national asset.

I beg to move the adoption of the report and accounts and the payment of a dividend at the rate of £15 per cent. per annum, less income tax."

The motion having been seconded and carried, an extraordinary general meeting was subsequently held and a resolution passed increasing the capital of the company from £100,000 to £150,000.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Bankruptcy Information

KEATS, PHILIP PHINEAS, 167, Mary Street, Balsall Heath, Birmingham, Chemist, August 25.

Notice of Dividend

CARTER, WILLIAM, "Claremont," Portland Road, East Grinstead, Sussex, Chemist. 2¾d. first or final. September 8. 12A, Marlborough Place, Brighton.

Companies Winding Up Voluntarily

BLACKAMOOR CHEMICAL AND COLOURS, LTD.: Liquidator, Mr. E. C. Finlason, 6, Quality Court, Chancery Lane, W.C.2., Accountant.

BRITISH MEDICINAL OIL REFINERS. (In voluntary liquidation). Creditors claims on or before September 23, to the Liquidator, Mr. C. J. Gladwell, 95, Cannon Street, London, E.C.4.

LONDON PHARMACEUTICAL REFINERS, LTD. (In voluntary liquidation). Creditors claims on or before September 23, to Liquidator, C. J. Gladwell, 95, Cannon Street, London, E.C.4.

PACIFIC PATENT FUEL CO., LTD. (In voluntary liquidation). A meeting of creditors will be held at the offices of Tribe, Clarke, Cawker, Owen & Co., Chartered Accountants, 56, Wind Street, Swansea, on September 6, at 12 noon, Sydney G. Owen, Liquidator.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration.*

*The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

CHESHIRE GLUE & CHEMICAL CO., LTD., Sandbach.—Registered August 13, mortgage securing all moneys due or to become due, to London County Westminster & Parr's Bank, Ltd.; charged on Minerva Works, Moston, Sandbach. *Nil. July 22, 1920.

HANCO GLASS CO., LTD., Ilford.—Registered August 17, £800 debenture, to Mrs. M. E. Hankinson, 9, Grosvenor Road, Ilford; general charge.

LYSOL LTD., London, E.C.—Registered August 19, debenture securing all moneys due or to become due, to Barclays Bank, Ltd.; general charge, except leasehold premises in Warton-Road, Stratford.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. Where a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

FORREST, JOSEPH, 50, Clyde Street, Jarrow-on-Tyne, analytical chemist, £10 15s. 6d., July 14.

NICHOLLS, RALPH, 351, Fulham Palace Road, Brompton, druggist and chemist, £23 16s. 6d., July 16.

Bill of Sale

[*The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.*]

WOODS, CHARLES, 77, Station Road, Norton, analytical chemist, filed August 26, £175.

An Announcement

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